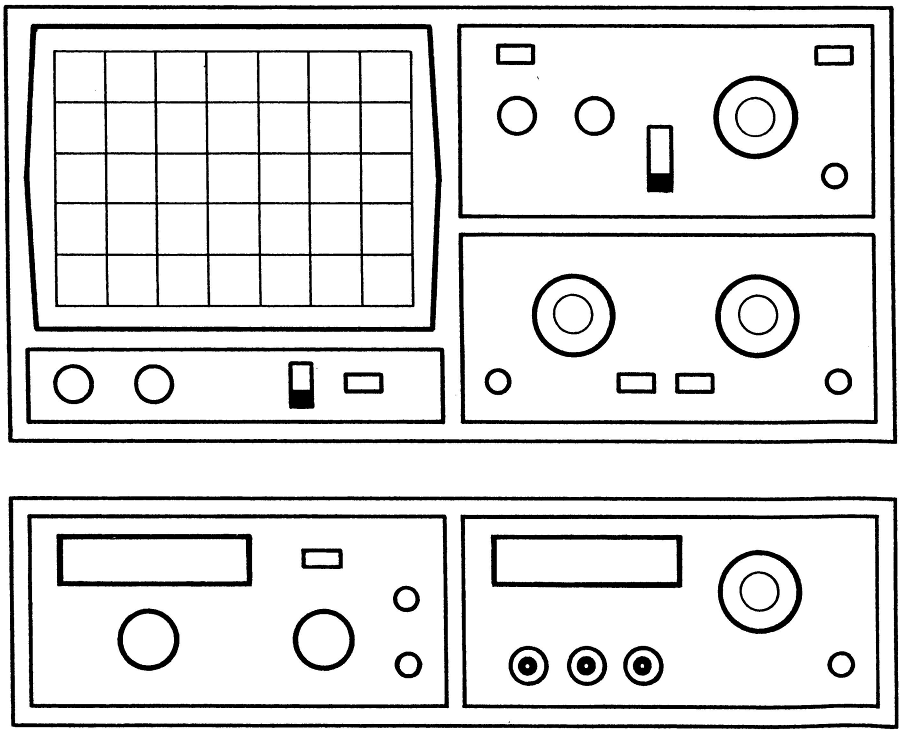
HAMEG
Instruments

MANUAL

Oscilloscope

Circuit diagrams **HM305**



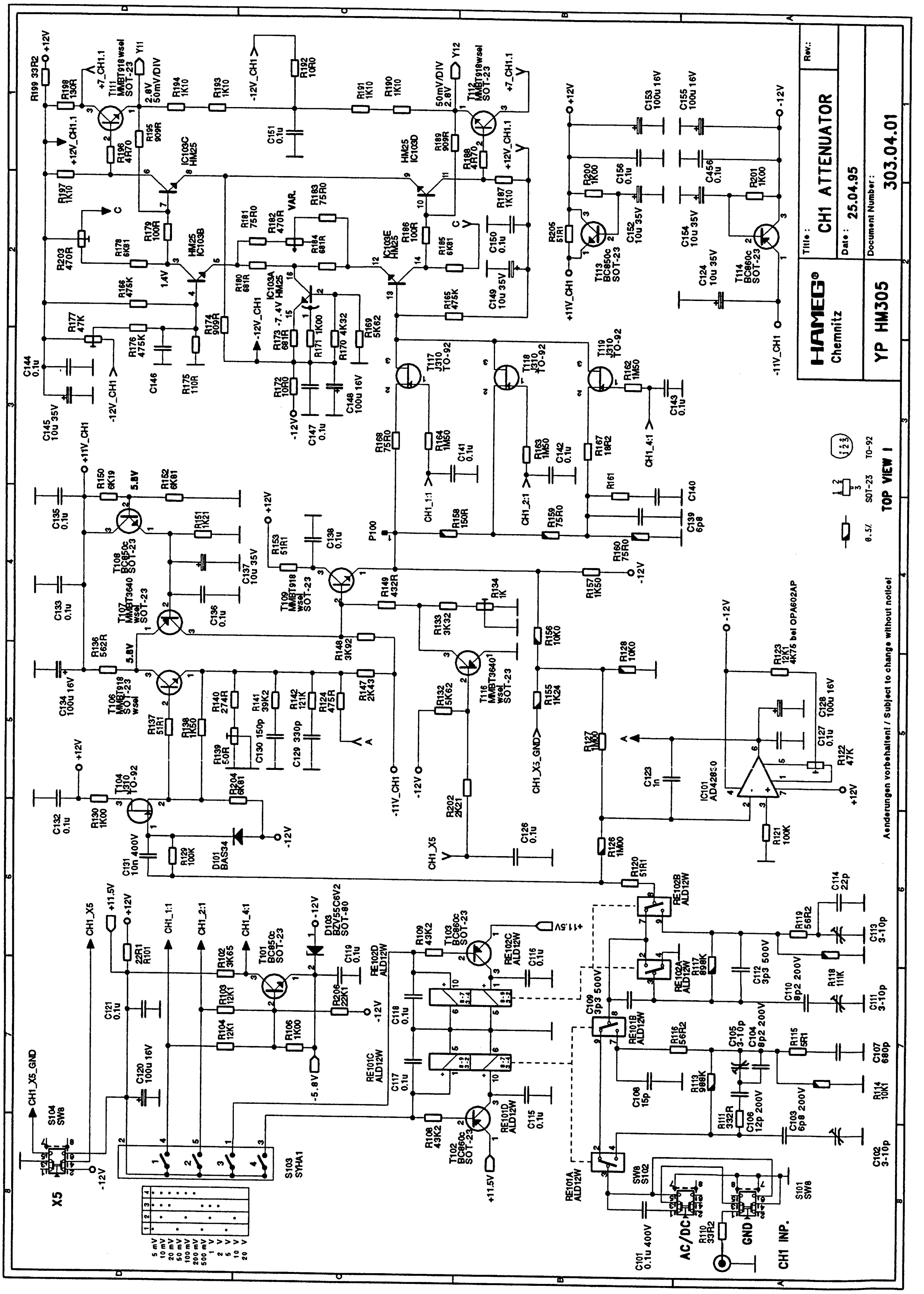
Oscilloscope

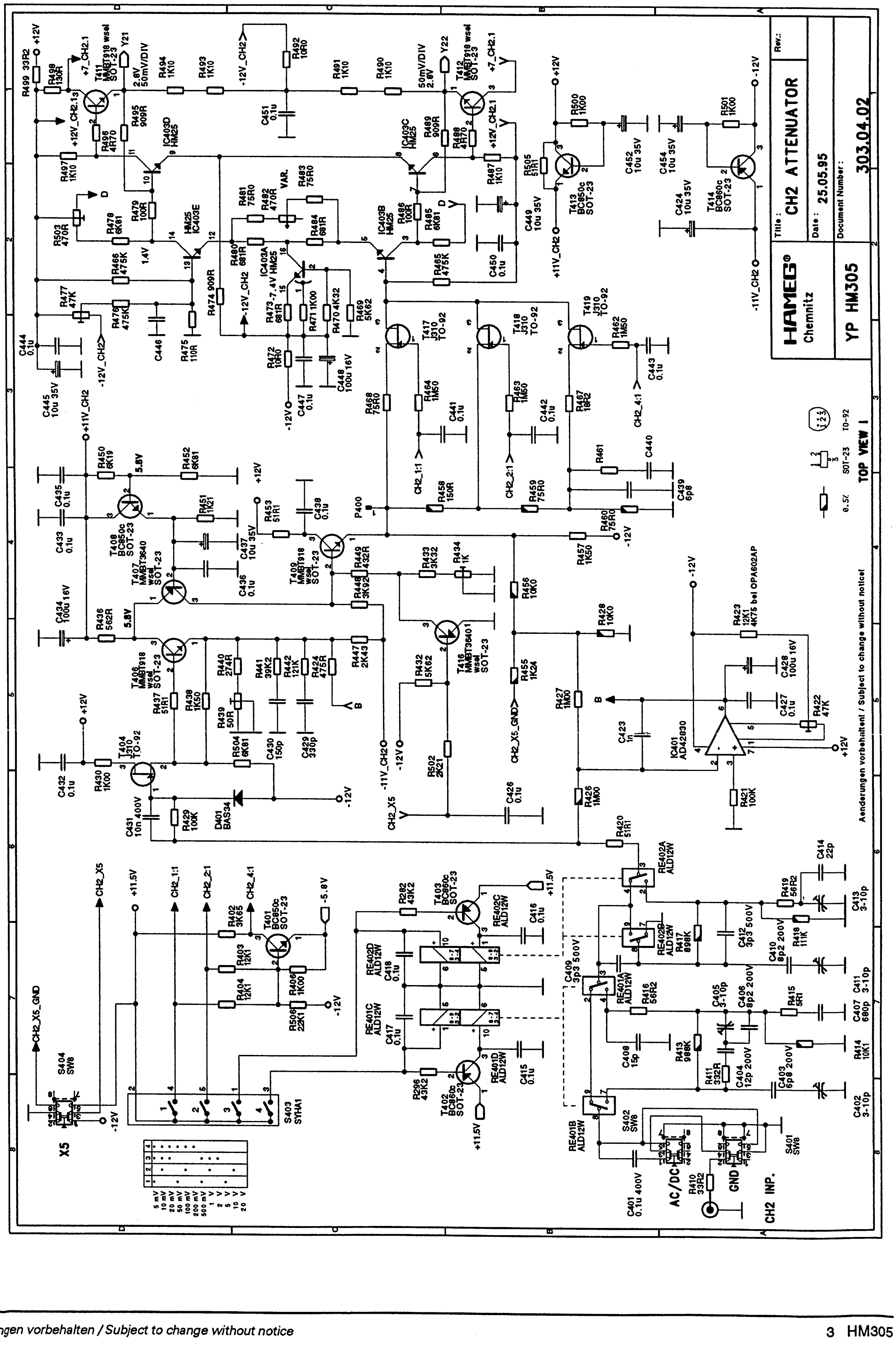
Circuit diagrams **HM305**

Y- Input, Attenuator, Preamplifier CH1 2
Y- Input, Attenuator, Preamplifier CHII 3
Y- Intermediate Amplifier CHI + CHII,
Channel Switch + Chopper Generator, ... 4
Analog/ digital Switch, TRIG. and
X- Signal Amplifier 4
Trigger Amplifier, Trigger Coupling,
TV Sync. Separator, ... 5
Peak Value Detection, Trigger Comparator 5
Timebase Sweep & Hold off Generator 6
Component Tester, Calibrator 7
Timebase, Trigger Logic 8
XY- Amplifier, YF- Amplifier, Overscan Circuit 9
Front/ Controlboard 10
CRT- Circuit, Unblanking, CRT- Board 11
Power Supply 12
Driver Stage (A/D) 13
A/D Converter, Address Counter, RAM'S,
Timebase (Digital), Control Logic 14
Display- Control, Address Counter, RAM,
Control Logic, HAMEG Bus Driver 15
Y D/A Converter, Dot Join,
Y- Analog Output Driver 16
+5V Analog Power Supply, IC Power Supply 17
YPA Board (Topside) 18
YPA Board (Bottomside) 19
Power Supply Board (Topside) 20
Adjustment Plan : Power Supply Board 21
Digital Board (Topside) 22
Adjustment Plan: Digital Board 23
Front Controlboard (Topside, Bottomside) 24
CRT Board (Topside, Bottomside) 25
XY Board (Topside) 26
XY Board (Bottomside) 27
TB Board (Topside) 28
TB Board (Bottomside) 29
CCT Board (Topside, Bottomside) 30

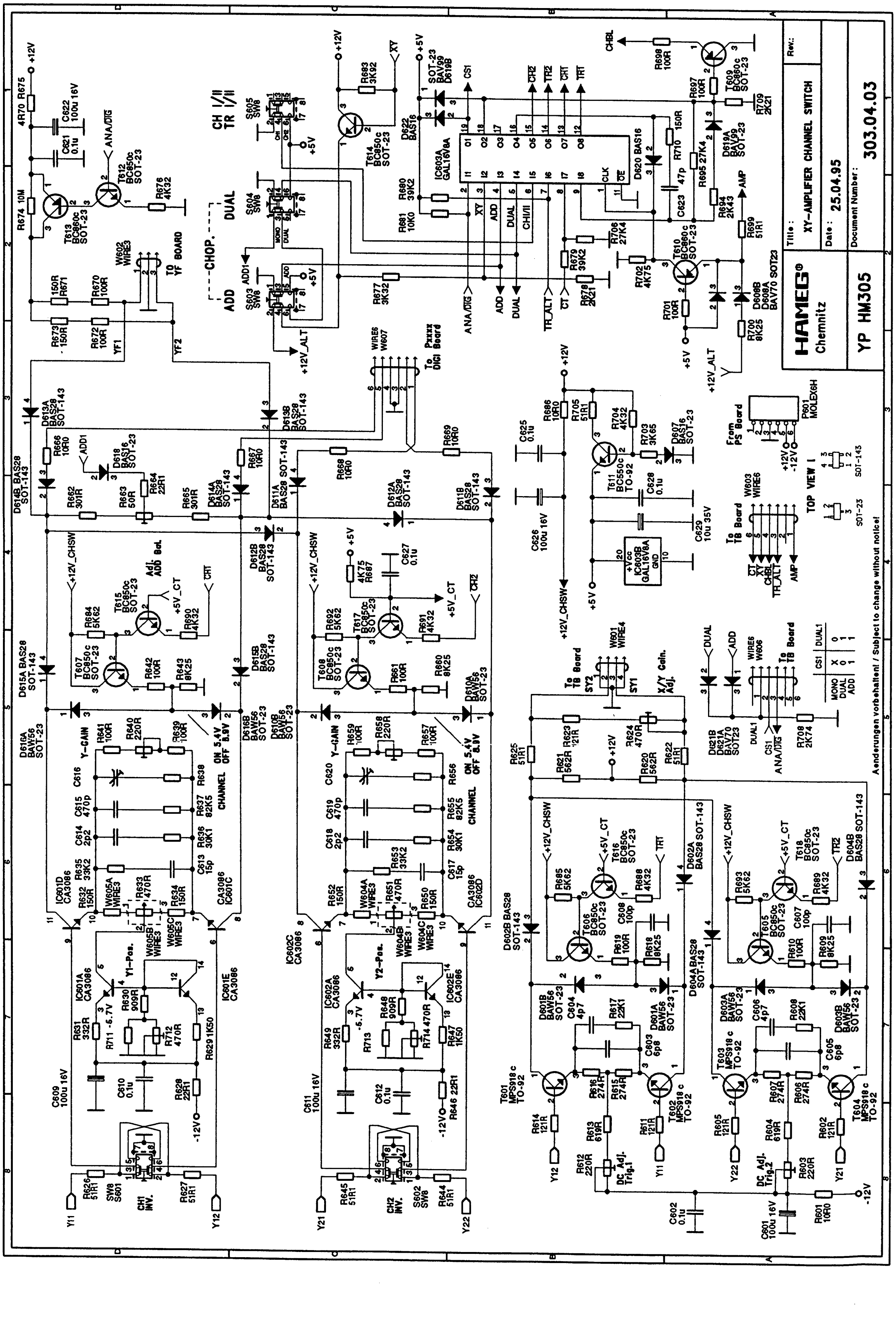
Adjustment Procedure 31

Y- Input, Attenuator, Preamplifier CH1

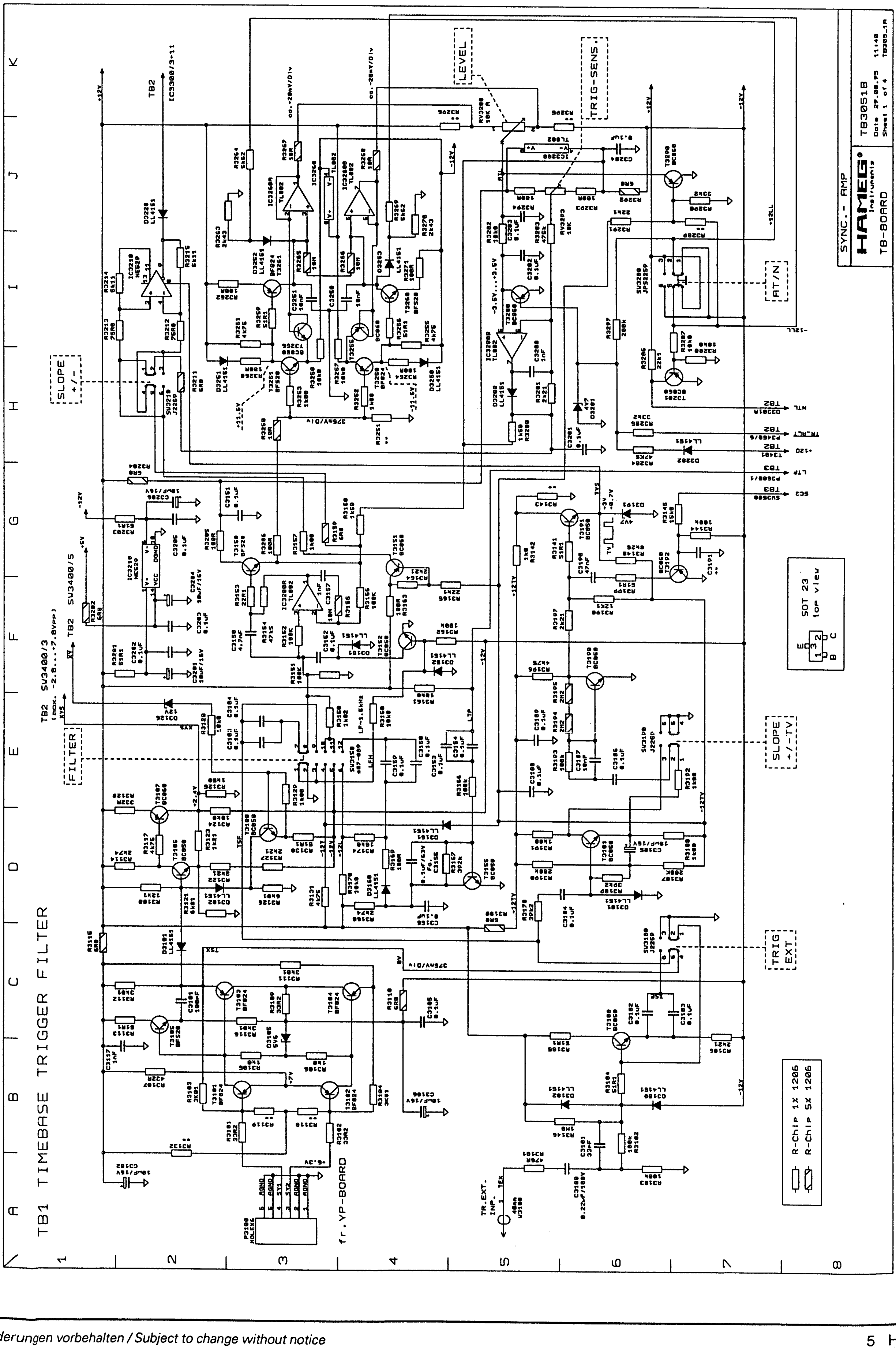

HAMEG®
Chemnitz
YP HM305
Title: CH1 ATTENUATOR
Date: 25.04.95
Document Number: 303.04.01
Rev.:
TOP VIEW I
SOT-23
TO-92
Änderungen vorbehalten / Subject to change without notice!
CH1 INP.
AC/DC
GND
X5
S103 SYHA1
5 mV
10 mV
20 mV
50 mV
100 mV
200 mV
500 mV
1 V
2 V
5 V
10 V
20 V
IC101 AD4280
4K75 bei OPA602AP

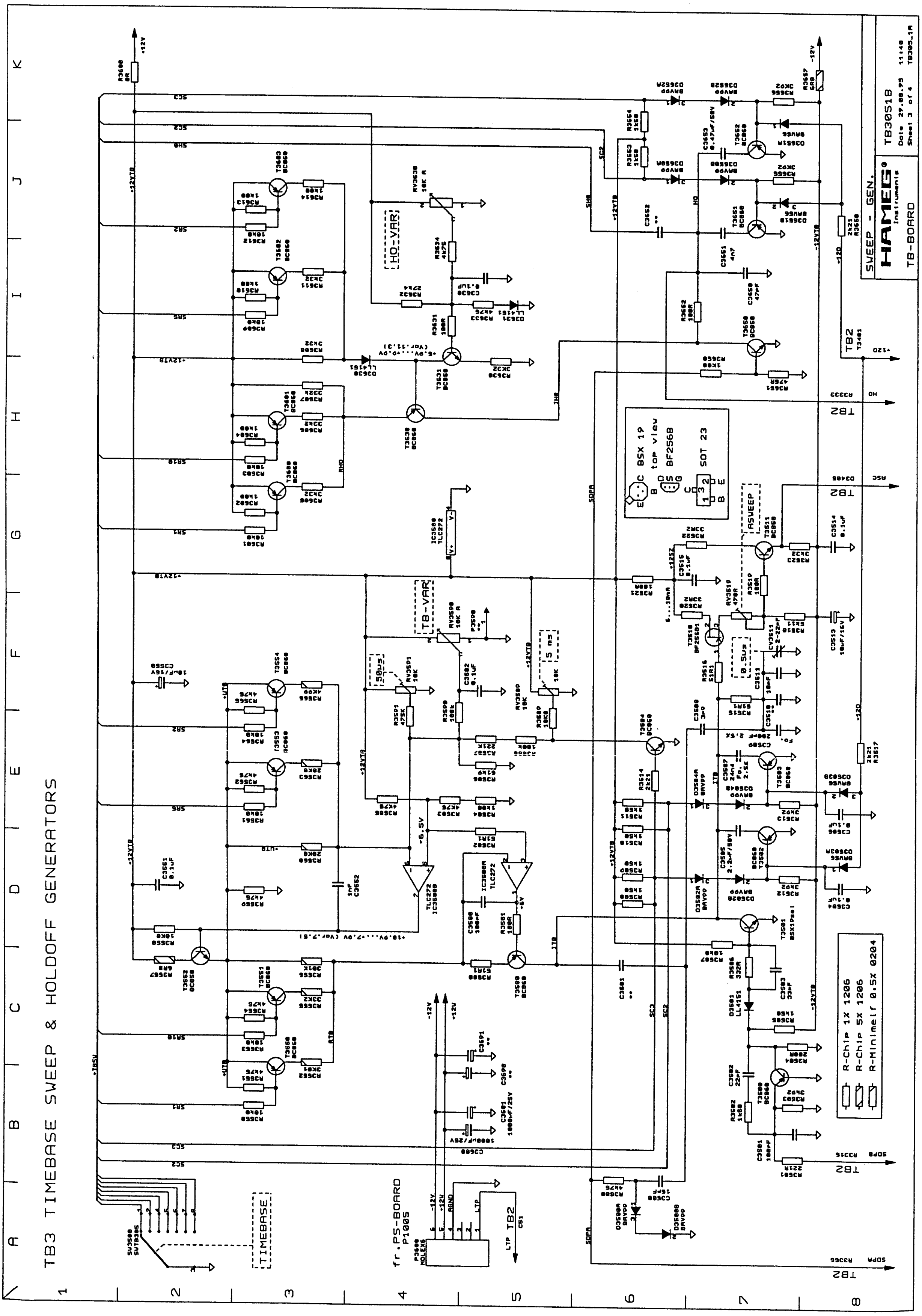

HAMEG®
Chemnitz
YP HM305
Title: CH2 ATTENUATOR
Date: 25.05.95
Document Number: 303.04.02
Rev.:
CH2 INP.
AC/DC
GND
X5
S401 SW8
S402 SW8
S403 SYHA1
S404 SW8
RE401A ALD12W
RE401B ALD12W
RE401C ALD12W
RE401D ALD12W
RE402A ALD12W
RE402B ALD12W
RE402C ALD12W
RE402D ALD12W
IC401 AD42030
IC403A HM25
IC403B HM25
IC403C HM25
IC403D HM25
IC403E HM25
T401 BC850c SOT-23
T402 BC860c SOT-23
T403 BC860c SOT-23
T404 J310 TO-92
T406 MMBT918 wsel SOT-23
T407 MMBT3640 wsel SOT-23
T408 BC850c SOT-23
T409 MMBT918 wsel SOT-23
T411 MMBT918 wsel SOT-23
T412 MMBT918 wsel SOT-23
T413 BC850c SOT-23
T414 BC860c SOT-23
T416 MMBT3640 wsel SOT-23
T417 J310 TO-92
T418 J310 TO-92
T419 J310 TO-92
D401 BAS34
P400
R423 12K1 4K75 bei OPA602AP
CH2_1:1
CH2_2:1
CH2_4:1
CH2_X5
CH2_X5_GND
+11V_CH2
-11V_CH2
+12V
-12V
+11.5V
+5.8V
-5.8V
Y21
Y22
2.8V 50mV/DIV
50mV/DIV 2.8V
+7_CH2.1
+12V_CH2.1
VAR.
TOP VIEW I
SOT-23
TO-92
0.5%
5 mV
10 mV
20 mV
50 mV
100 mV
200 mV
1 V
2 V
5 V
10 V
20 V
Aenderungen vorbehalten! / Subject to change without notice!

Y- Intermediate Amplifier CHI + CHII, Channel Switch + Chopper Generator, Analog/ digital Switch, TRIG. and X- Signal Amplifier

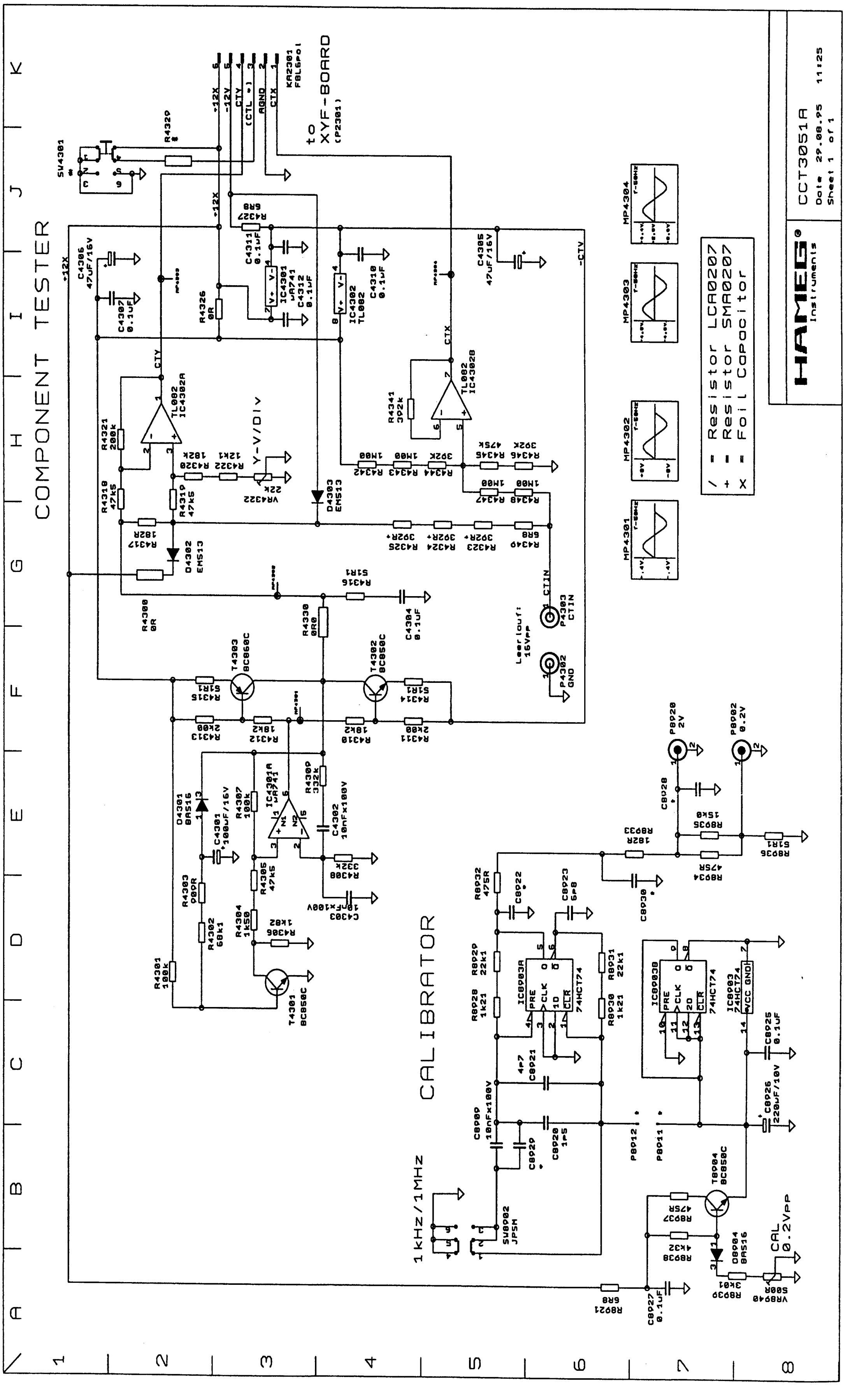

HAMEG®
Chemnitz
YP HM305
Title: XY-AMPLIFIER CHANNEL SWITCH
Date: 25.04.95
Document Number: 303.04.03
Rev.:
CH I/II
TR I/II
DUAL
CHOP.
ADD
Y-GAIN
CHANNEL
Y1-Pos.
Y2-Pos.
CH1 INV.
CH2 INV.
DC Adj. Trig.1
DC Adj. Trig.2
X/Y Coln. Adj.
Adj. ADD Bal.
TO YF BOARD
To Pxxxx DIGI Board
To TB Board
From PS Board
TOP VIEW I
Änderungen vorbehalten / Subject to change without notice!

Trigger Amplifier, Trigger Coupling, TV Sync. Separator, Peak Value Detection, Trigger Comparator

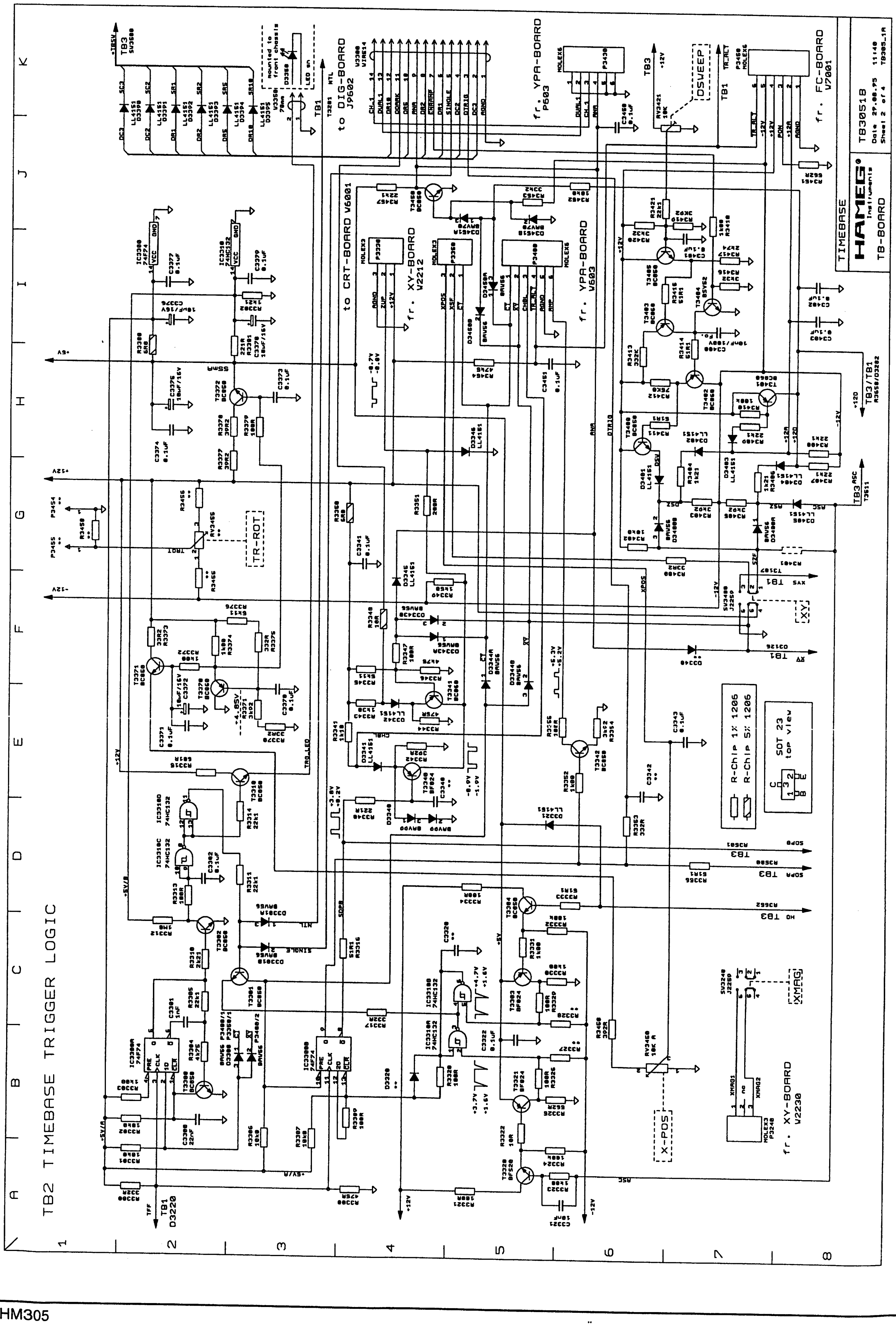

TB1 TIMEBASE TRIGGER FILTER
SYNC.- AMP
HAMEG Instruments
TB-BOARD
TB3051B
LEVEL
TRIG-SENS.
SLOPE +/-
FILTER
SLOPE +/-TV
TRIG EXT
AT/N
TR.EXT. INP.
fr. YP-BOARD
SOT 23 Top view
R-Chip 1X 1206
R-Chip 5X 1206

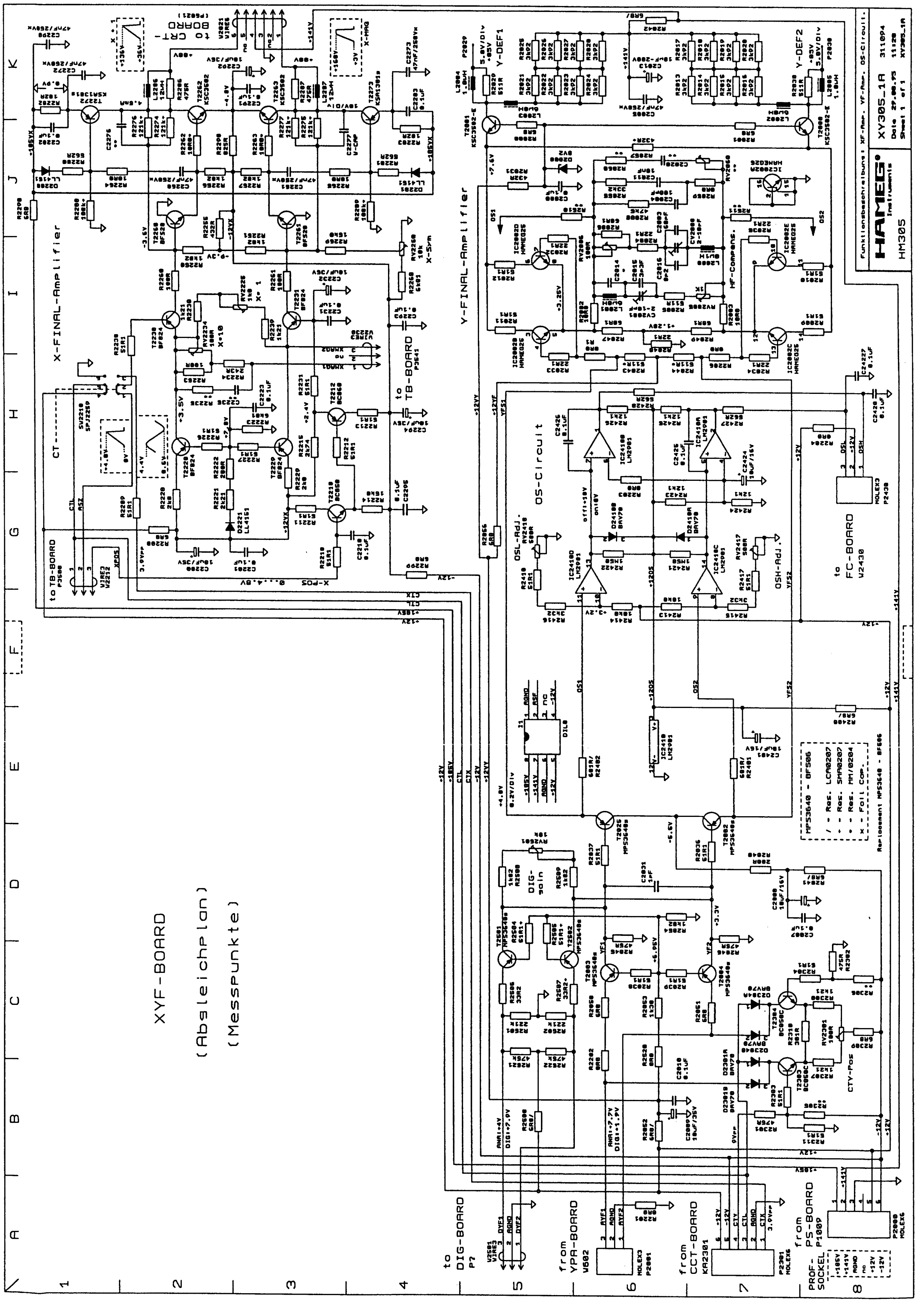

TB3 TIMEBASE SWEEP & HOLDOFF GENERATORS
SWEEP - GEN.
HAMEG Instruments
TB-BOARD
TB3051B
HO-VAR
TB-VAR
TIMEBASE
fr. PS-BOARD
BSX 19 top view BF256B
SOT 23
ASWEEP
TB2
R-Chip 1X 1206
R-Chip 5X 1206
R-Minimelf 0.5X 0204
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8

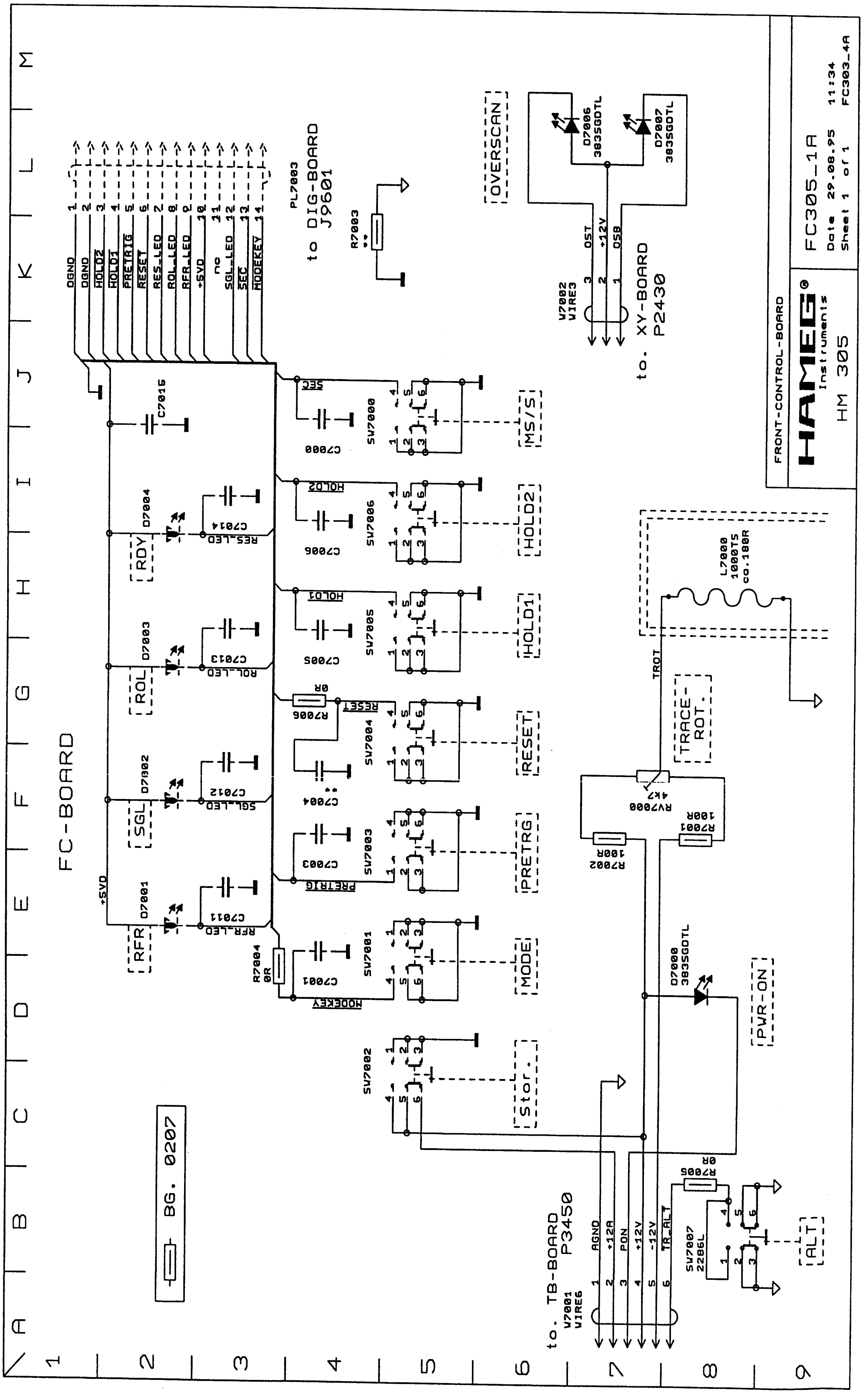
Änderungen vorbehalten / Subject to change without notice

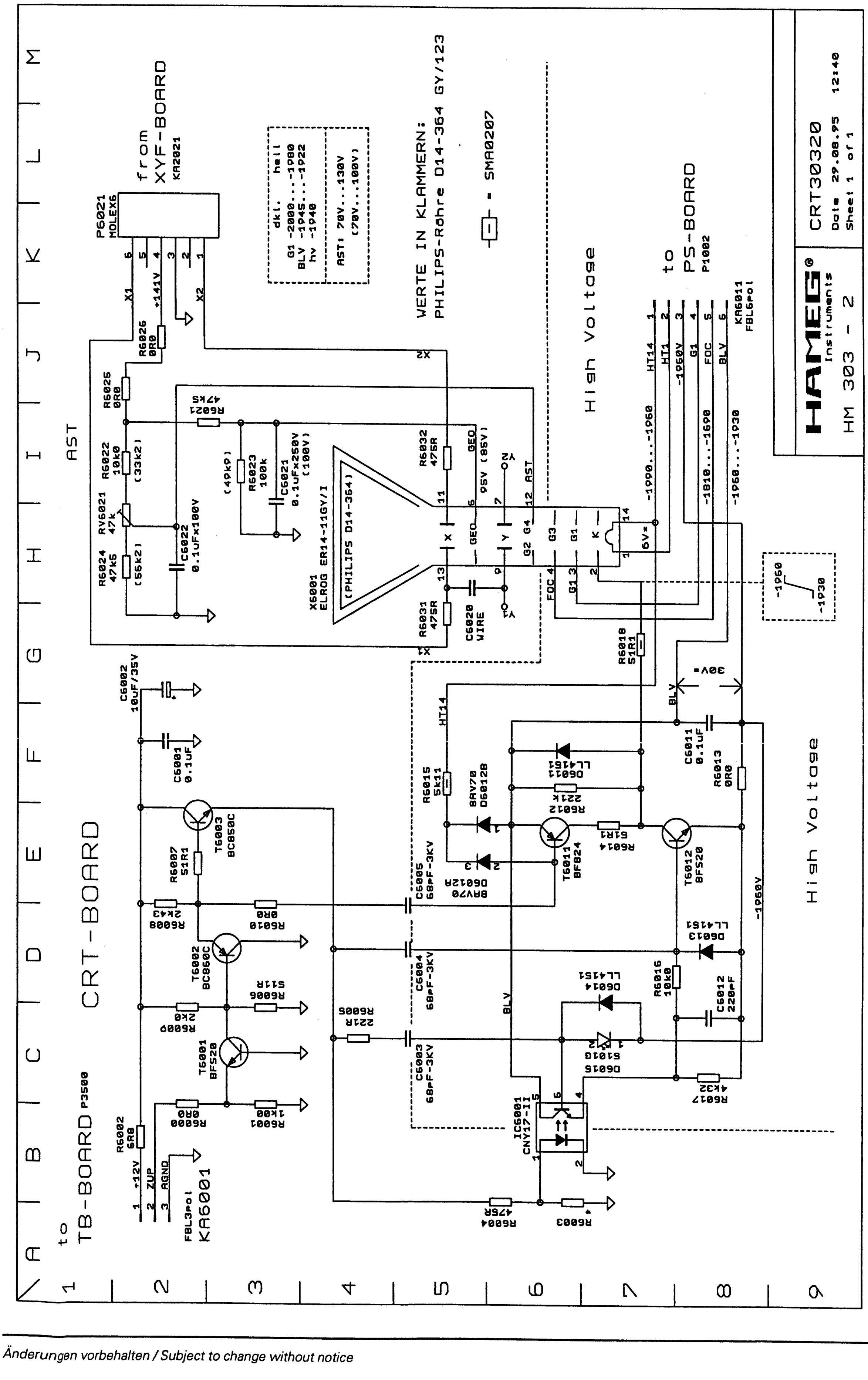

COMPONENT TESTER
CALIBRATOR
to XYF-BOARD (P2301)
Y-V/DIV
Leerlauf: 16Vpp
1kHz/1MHz
CAL 0.2Vpp
/ = Resistor LCA0207
= = Resistor SMA0207
+ = Foil Capacitor
HAMEG Instruments
CCT3051A
Date 29.08.95 11:25
Sheet 1 of 1

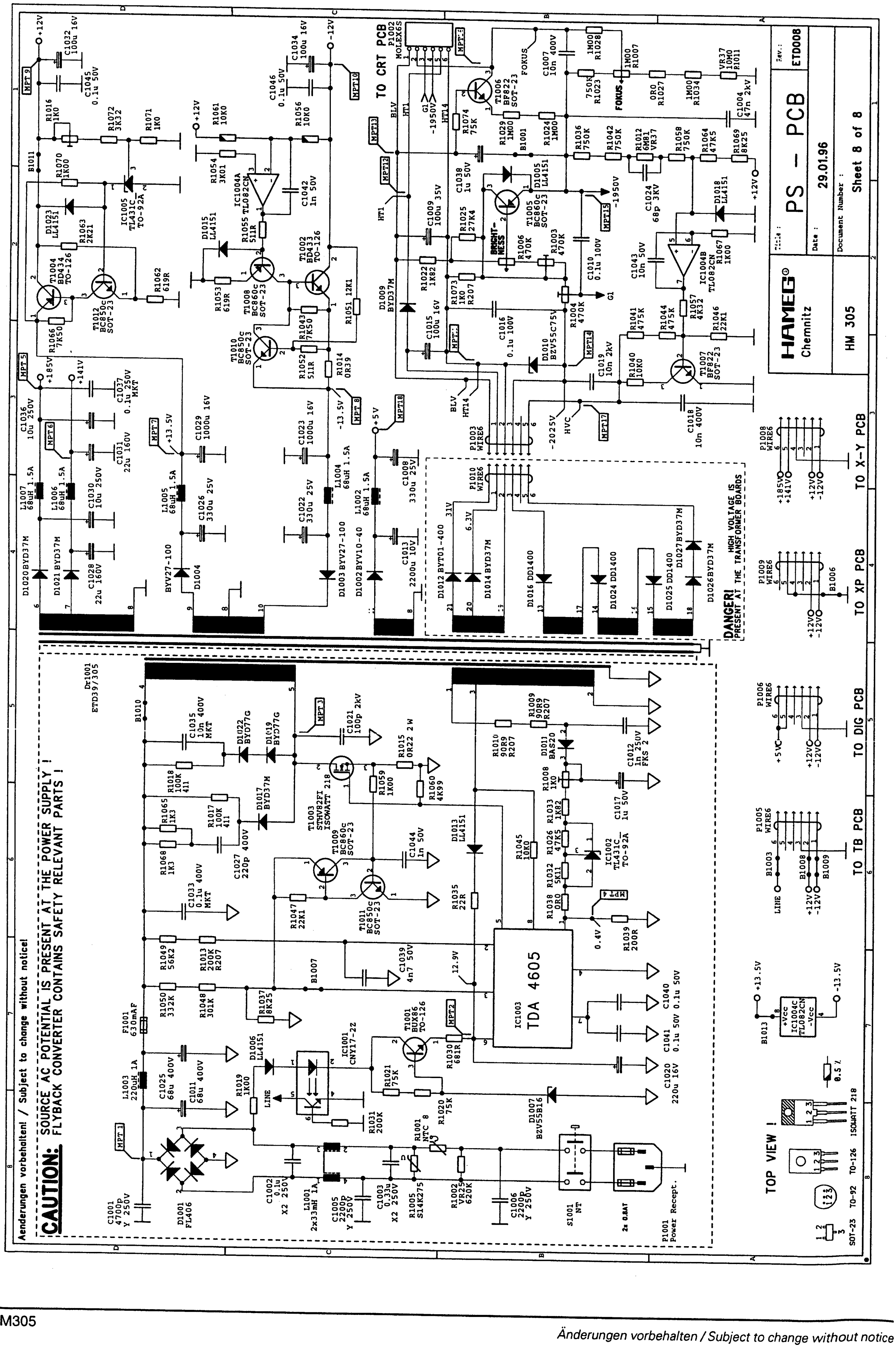
Timebase, Trigger Logic

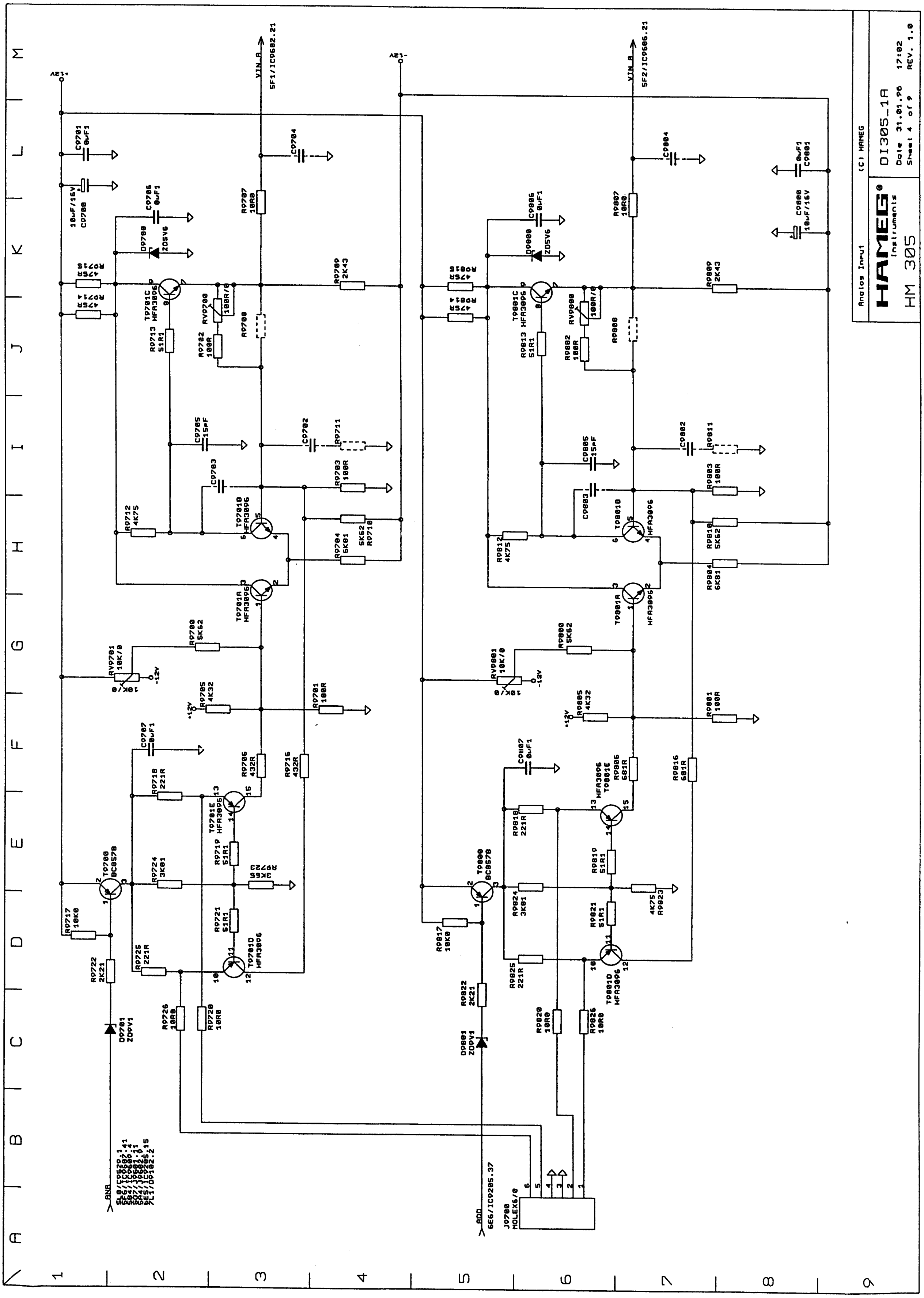

TB2 TIMEBASE TRIGGER LOGIC
TIMEBASE
HAMEG Instruments
TB-BOARD
TB3051B
Date 29.08.95 11:40
Sheet 2 of 4 TB305_1A
fr. FC-BOARD V7001
fr. YPA-BOARD P603
fr. YPA-BOARD V603
to DIG-BOARD J9602
to CRT-BOARD V6001
fr. XY-BOARD V2212
fr. XY-BOARD V2230
TR-ROT
X-POS
XY
XMAG
DSWEEP
R-Chip 1% 1206
R-Chip 5% 1206
SOT 23 top view
IC3300A 74F74
IC3300B 74F74
IC3310A 74HC132
IC3310B 74HC132
IC3310C 74HC132
IC3310D 74HC132
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8


XYF-BOARD
(Abgleichplan)
(Messpunkte)
X-FINAL-Amplifier
Y-FINAL-Amplifier
OS-Circuit
HF-Compens.
to CRT-BOARD
to TB-BOARD
to FC-BOARD
to DIG-BOARD
from YPA-BOARD
from CCT-BOARD
from PS-BOARD
PROF-SOCKEL
Y-DEF1
Y-DEF2
X-POS
CTY-POS
OSL-Adj.
OSH-Adj.
HAMEG Instruments
HM305
XY305_1A
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8

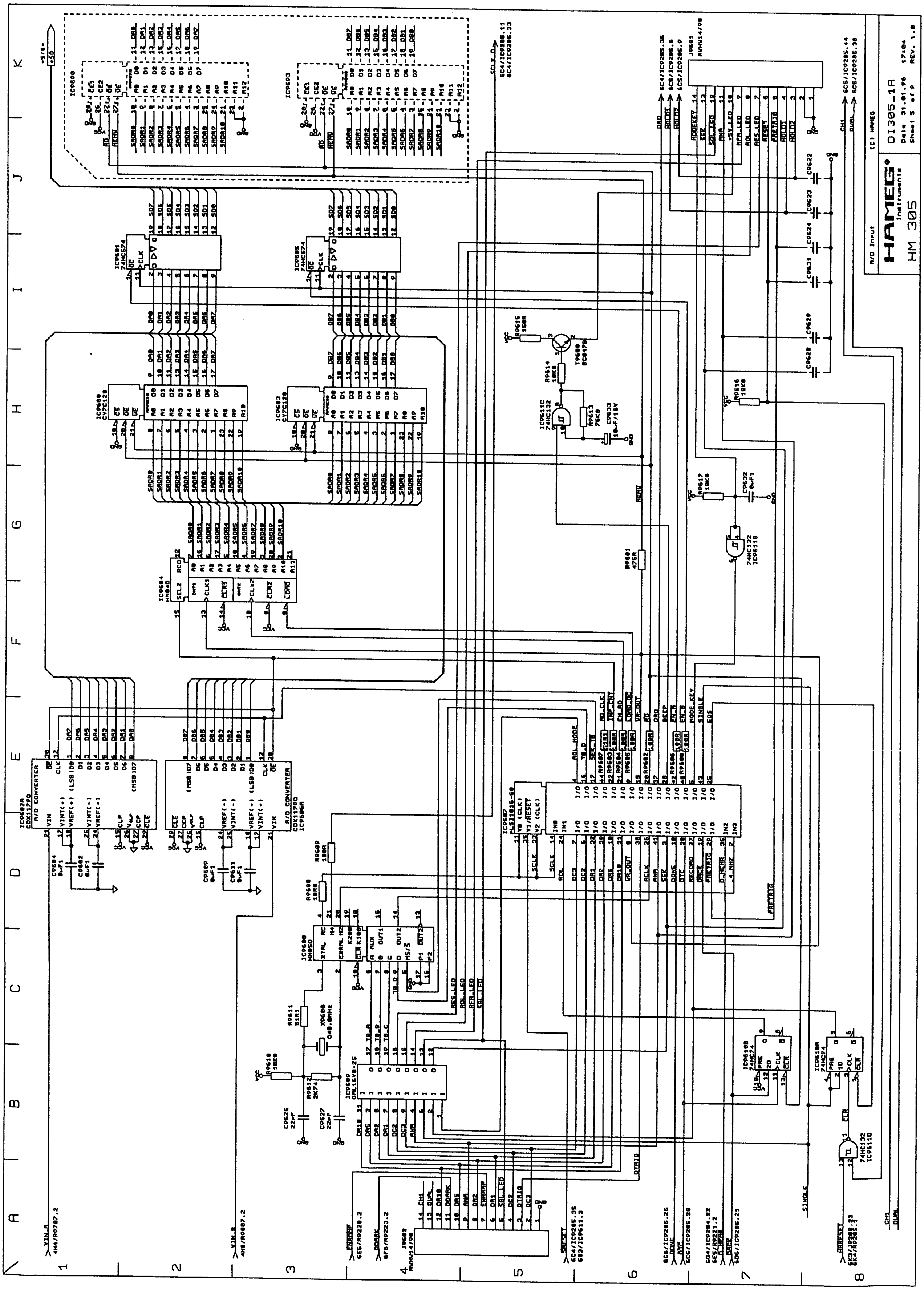

FC-BOARD
to DIG-BOARD
J9601
PL7003
DGND
DGND
HOLD2
HOLD1
PRETRIG
RESET
RES_LED
ROL_LED
RFR_LED
+5VD
nc
SGL_LED
SEC
MODEKEY
R7003
OVERSCAN
D7006
383SGDTL
D7007
383SGDTL
OST
+12V
OSB
V7002
WIRE3
to XY-BOARD
P2430
FRONT-CONTROL-BOARD
HAMEG
Instruments
HM 305
FC305_1A
Date 29.08.95
11:34
Sheet 1 of 1
FC303_4A
C7015
C7000
SW7000
MS/S
RDY
D7004
C7014
C7006
SW7006
HOLD2
ROL
D7003
C7013
C7005
SW7005
HOLD1
R7006
0R
SW7004
RESET
SGL
D7002
C7012
C7004
C7003
SW7003
PRETRG
RFR
D7001
C7011
R7004
0R
C7001
SW7001
MODE
SW7002
Stor.
L7000
1000TS
co.100R
TROT
TRACE-ROT.
RV7000
4k7
R7001
100R
R7002
100R
D7000
383SGDTL
PWR-ON
BG. 0207
to TB-BOARD
P3450
V7001
WIRE6
AGND
+12A
PON
+12V
-12V
TB_ALT
R7005
0R
SW7007
2286L
ALT
A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6
7
8
9


CRT-BOARD
to TB-BOARD P3500
FBL3pol KA6001
1 +12V
2 ZUP
3 AGND
from XYF-BOARD KA2021
P6021 MOLEX6
+141V
X1
X2
to PS-BOARD P1002
KA6011 FBL6pol
HT14
HT1
-1960V
G1
FOC
BLV
-1900...-1960
-1810...-1690
-1960...-1930
High Voltage
AST
WERTE IN KLAMMERN:
PHILIPS-Röhre D14-364 GY/123
= SMA0207
dkl. hell
G1 -2000...-1980
BLV -1945...-1922
hv -1940
AST: 70V...130V
(70V...100V)
X6001 ELROG ER14-11GY/1
(PHILIPS D14-364)
R6021 47k5
R6022 10k0 (33k2)
R6023 100k (4k0)
R6024 47k5 (56k2)
R6025 0R0
R6026 0R0
RV6021 47k
C6021 0.1uFx250V (100V)
C6022 0.1uFx100V
R6031 475R
R6032 475R
C6020 WIRE
GEO
95V (85V)
G2 G4
G3
G1
K
6V=
C6001 0.1uF
C6002 10uF/35V
R6000 0R0
R6001 1k00
R6002 6R8
R6003
R6004 475R
R6005 221R
R6006 511R
R6007 51R1
R6008 2k43
R6009 2k0
R6010 0R0
T6001 BF520
T6002 BC860C
T6003 BC850C
C6003 68pF-3KV
C6004 68pF-3KV
C6005 68pF-3KV
IC6001 CNY17-II
R6012 221k
R6013 0R0
R6014 51R1
R6015 5k11
R6016 10k0
R6017 4k32
R6018 51R1
C6011 0.1uF
C6012 220pF
T6011 BF824
T6012 BF520
D6011 LL4151
D6012A BAV70
D6012B BAV70
D6013 LL4151
D6014 LL4151
D6015 S1010
30V=
-1960
-1930
HAMEG Instruments
HM 303 - 2
CRT30320
Date 29.08.95 12:40
Sheet 1 of 1


Änderungen vorbehalten! / Subject to change without notice!
CAUTION: SOURCE AC POTENTIAL IS PRESENT AT THE POWER SUPPLY ! FLYBACK CONVERTER CONTAINS SAFETY RELEVANT PARTS !
DANGER! HIGH VOLTAGE IS PRESENT AT THE TRANSFORMER BOARDS
HAMEG Chemnitz
HM 305
PS - PCB
29.01.96
Sheet 8 of 8
ETD008
TO CRT PCB
TO X-Y PCB
TO XP PCB
TO DIG PCB
TO TB PCB
TOP VIEW !
IC1003 TDA 4605
Dr1001 ETD39/305
P1001 Power Recept.
S1001 NT
F1001 630mAF
D1001 FL406
T1003 STW9RFI ISOWATT 218
T1001 BUX86 TO-126
IC1001 CNY17-22
IC1002 TL431C TO-92A
IC1005 TL431C TO-92A
IC1004A TL082CN
IC1004B TL082CN
+12V
-12V
+5V
+185V
+141V
+13.5V
-13.5V
-1950V
-2025V
SOT-23
TO-92
TO-126
ISOWATT 218


Analog Input
(C) HAMEG
HAMEG Instruments
HM 305
DI305_1A
Date 31.01.96 17:02
Sheet 4 of 9
REV. 1.0
VIN_A
SF1/IC0602.21
SF2/IC0606.21
+12V
-12V
T0701C HFA3096
T0701B HFA3096
T0701A HFA3096
T0701E HFA3096
T0701D HFA3096
T0700 BC857B
T0801C HFA3096
T0801B HFA3096
T0801A HFA3096
T0801E HFA3096
T0801D HFA3096
T0800 BC857B
R0707 10R0
R0807 10R0
C0704
C0804
C0701 0uF1
C0801 0uF1
C0700 10uF/16V
C0800 10uF/16V
C0706 0uF1
C0806 0uF1
D0700 ZD5V6
D0800 ZD5V6
R0714 475R
R0715 475R
R0814 475R
R0815 475R
R0709 2K43
R0809 2K43
RV0700 100R/0
RV0800 100R/0
R0702 100R
R0802 100R
R0713 51R1
R0813 51R1
R0708
R0808
C0705 15pF
C0805 15pF
C0702
C0802
R0711
R0811
C0703
C0803
R0703 100R
R0803 100R
R0712 4K75
R0812 4K75
R0704 6K81
R0804 6K81
R0710 5K62
R0810 5K62
R0700 5K62
R0800 5K62
RV0701 10K/0
RV0801 10K/0
R0705 4K32
R0805 4K32
R0701 100R
R0801 100R
C0707 0uF1
C0807 0uF1
R0718 221R
R0818 221R
R0706 432R
R0806 681R
R0716 432R
R0816 681R
R0719 51R1
R0819 51R1
R0724 3K01
R0824 3K01
R0723 3K92
R0823 4K75
R0721 51R1
R0821 51R1
R0717 10K0
R0817 10K0
R0722 2K21
R0822 2K21
R0725 221R
R0825 221R
R0726 10R0
R0720 10R0
R0820 10R0
R0826 10R0
D0701 ZDPV1
D0801 ZDPV1
BNA
ADD
6E6/IC0205.37
J0700 MOLEX6/0
A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6
7
8
9

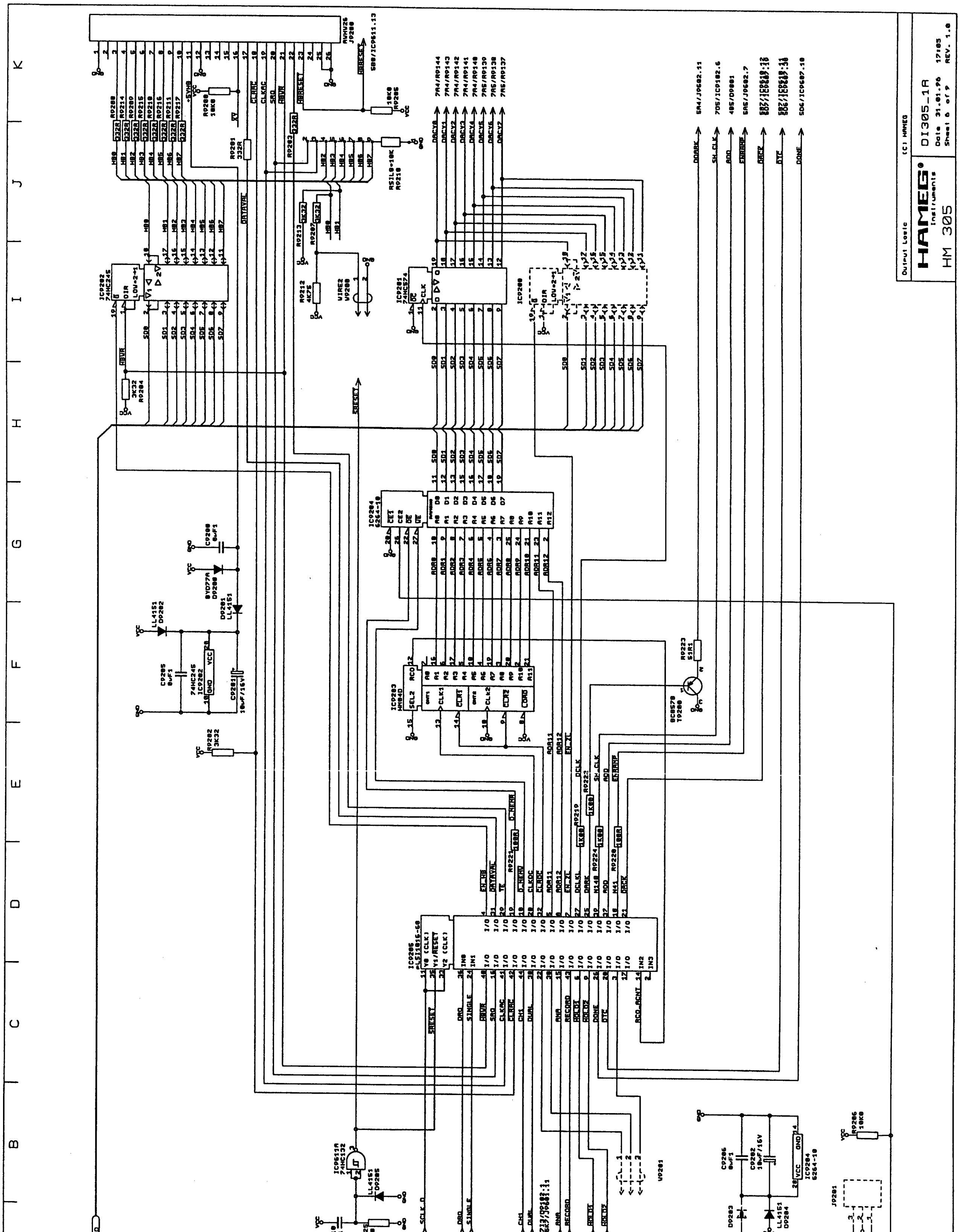
A/D Converter, Address Counter, RAM'S, Timebase (Digital), Control Logic



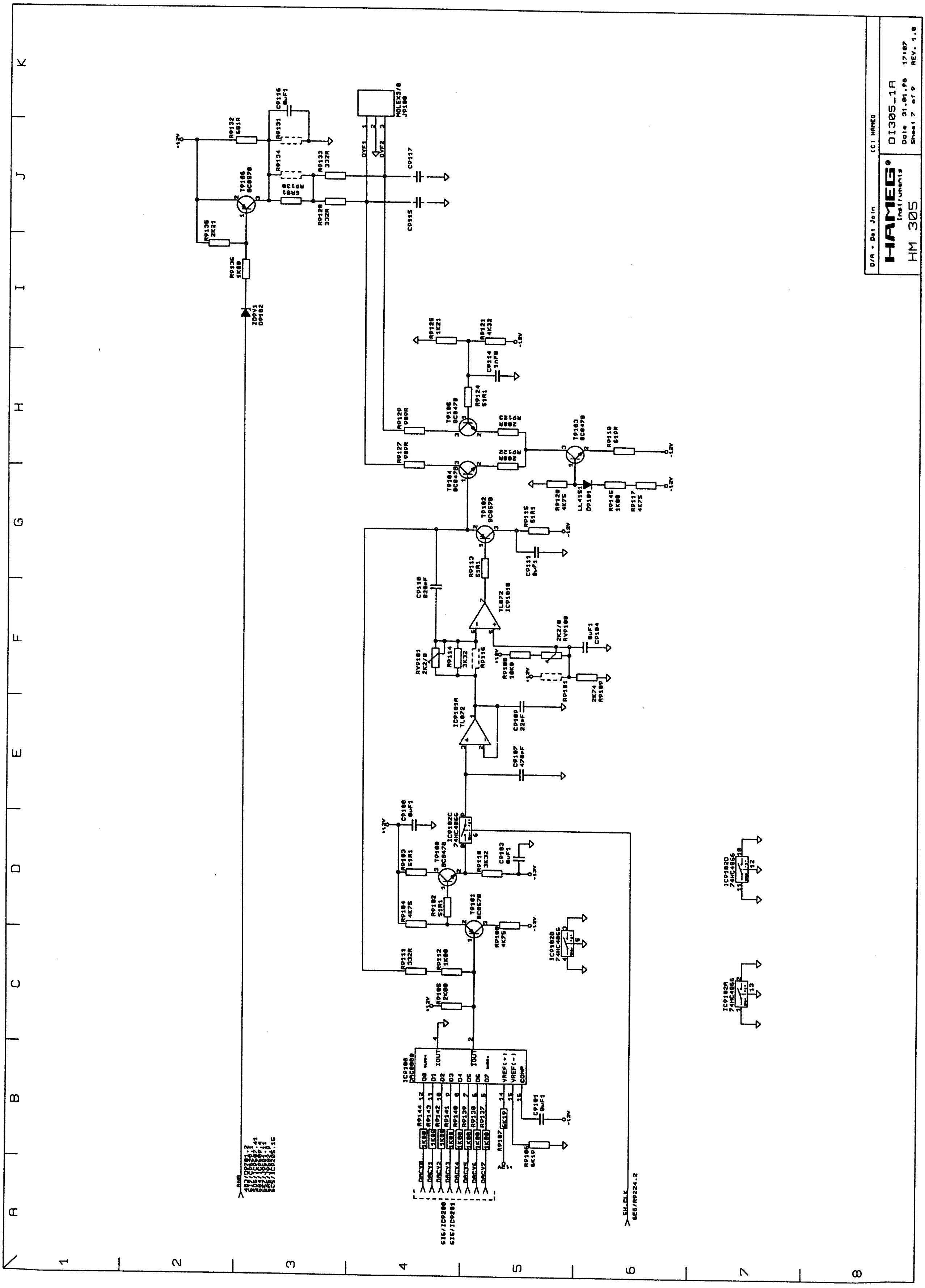
HAMEG Instruments
HM 305
A/D Input
DI305_1A
Date 31.01.96
Sheet 5 of 9
REV. 1.0
(C) HAMEG
IC9682A CDX1179Q A/D CONVERTER
IC9686A CDX1179Q A/D CONVERTER
IC9680 CY7C128
IC9682 CY7C128
IC9681 74HC574
IC9685 74HC574
IC9684 HM84D
IC9687 EPM7032
IC9688 HM85D
IC9689 GAL16V8-25
IC9610A 74HC74
IC9610B 74HC74
IC9611C 74HC132
J9681
J9682
X9680 040.0MHz
T9680 BC847B

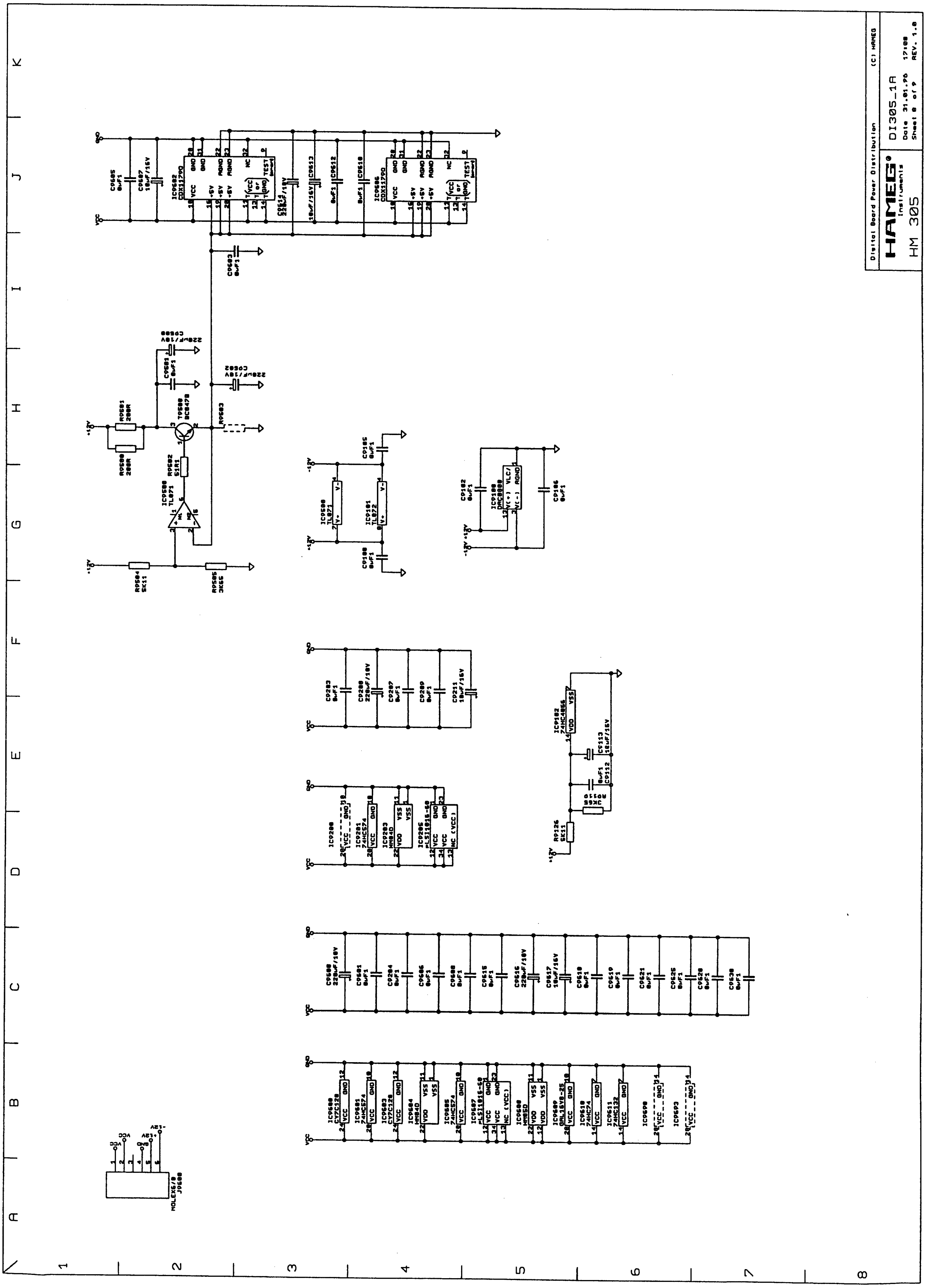
Änderungen vorbehalten / Subject to change without notice

Display- Control, Address Counter, RAM, Control Logic, HAMEG Bus Driver

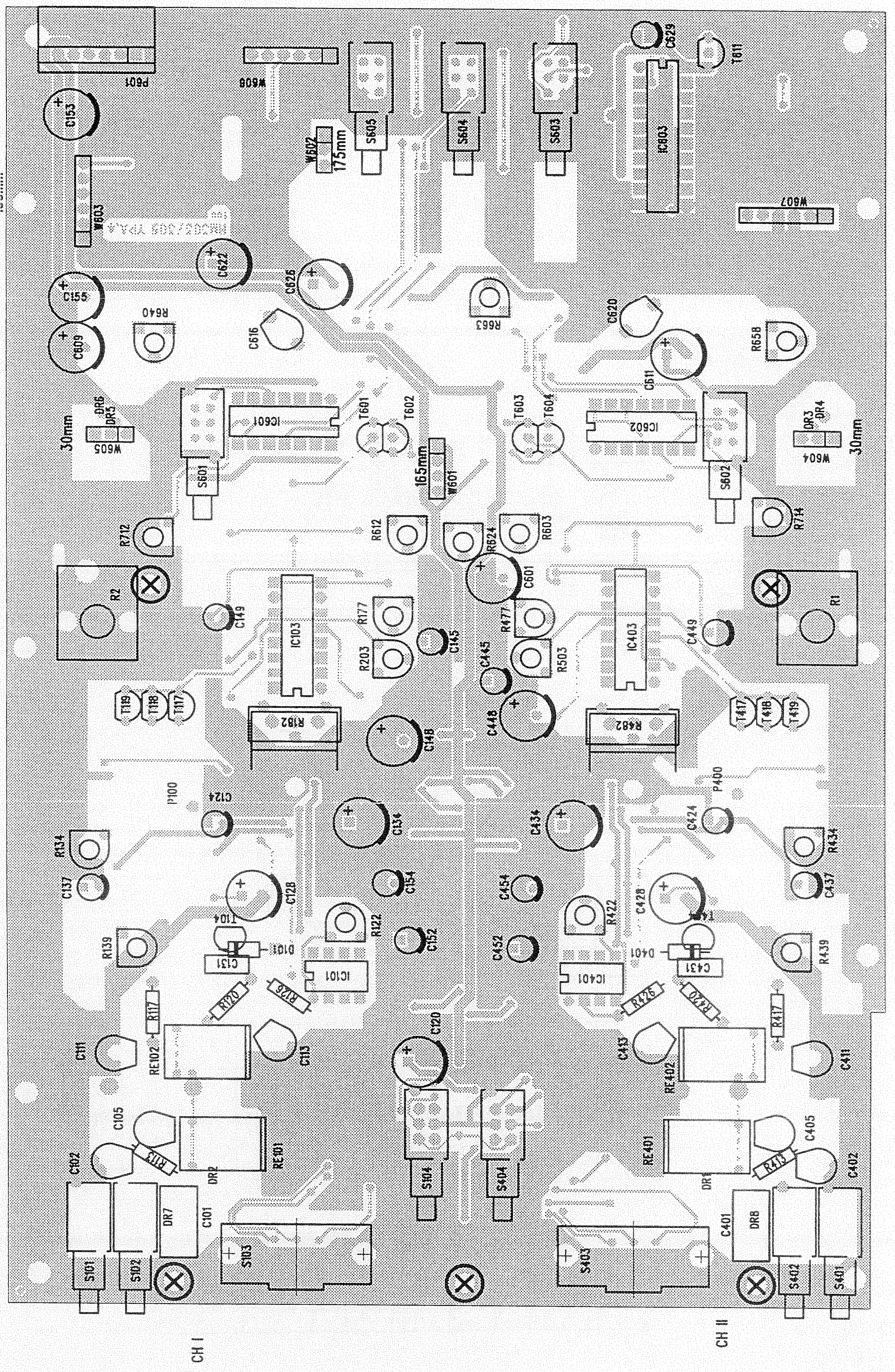

Output Logic
(C) HAMEG
HAMEG Instruments
HM 305
DI305_1A
Date 31.01.96
Sheet 6 of 9
17:05
REV. 1.0
IC0202 74HC245
IC0201 74HC574
IC0200
IC0204 6264-10
IC0203 HM82D
IC0205 PLSI1016-60
IC0611A 74HC132
T0200 BC0570
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8

Y D/A Converter, Dot Join, Y- Analog Output Driver

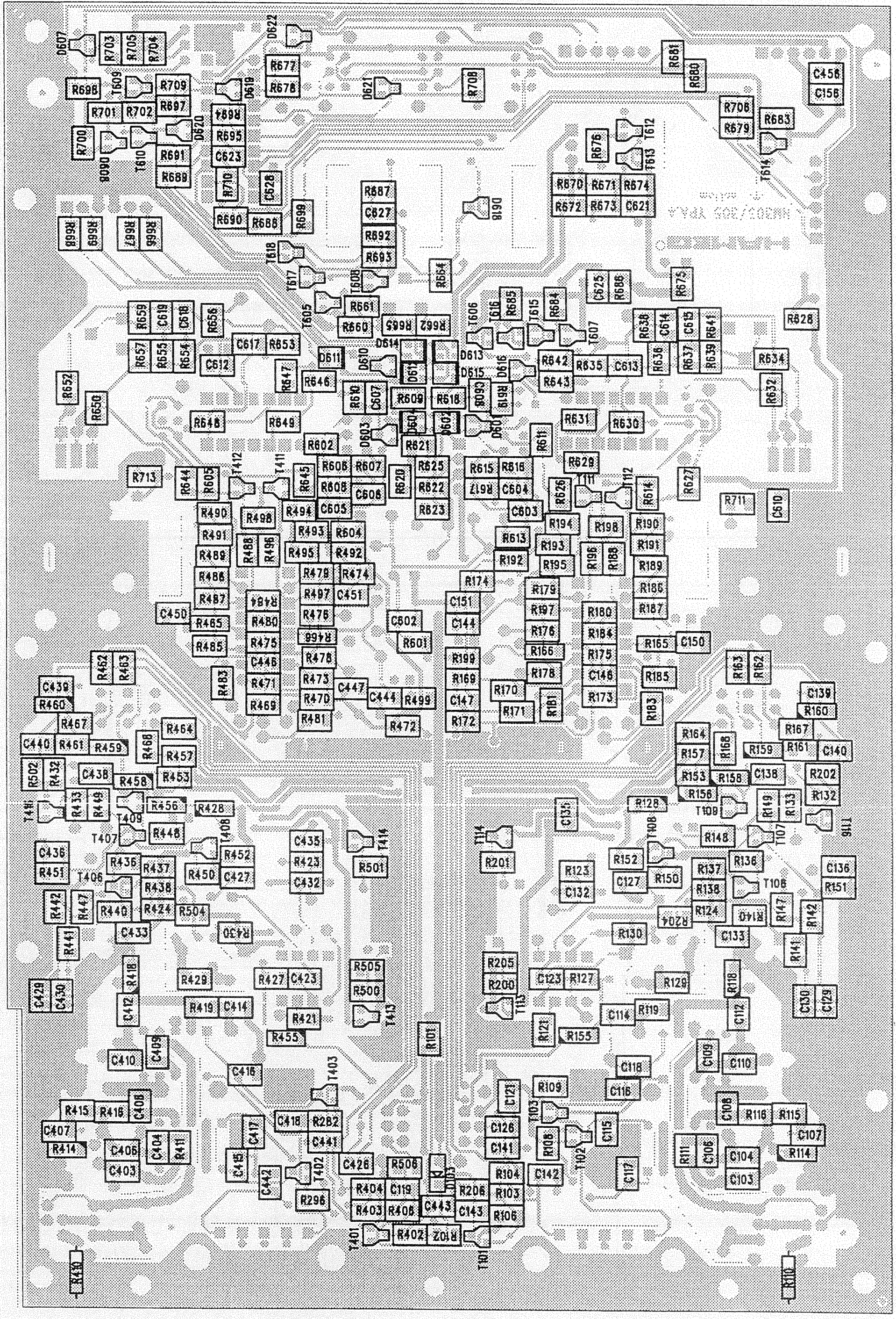

(C) HAMEG
D/A + Dot Join
HAMEG Instruments
HM 305
DI305_1A
Date 31.01.96
Sheet 7 of 9
REV. 1.0
MOLEX3/8
DAC0800
TL072
BC847B
BC857B
74HC4066
DACY0
DACY1
DACY2
DACY3
DACY4
DACY5
DACY6
DACY7
IOUT
VREF(+)
VREF(-)
COMP
SH_CLK
+12V
-12V
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8


Digital Board Power Distribution
(C) HAMEG
HAMEG® Instruments
HM 305
DI305_1A
Date 31.01.96
Sheet 8 of 9
REV. 1.0
IC9602 CDX1172DQ
IC9606 CDX1172DQ
IC9500 TL071
T9500 BC847B
R9501 200R
R9500 200R
R9502 51R1
R9504 5K11
R9505 3K65
R9503
C9502 220uF/16V
C9500 220uF/16V
C9501 0uF1
C9503 0uF1
C9605 0uF1
C9607 10uF/16V
C9613
C9612 0uF1
C9610 0uF1
C9614 220uF/16V
IC9100 TL071
IC9101 TL072
IC9100 DAC8800
C9185 0uF1
C9188 0uF1
C9182 0uF1
C9186 0uF1
C9203 0uF1
C9208 220uF/16V
C9207 0uF1
C9209 0uF1
C9211 10uF/16V
IC9102 74HC4066
C9113 10uF/16V
C9112 0uF1
R9126 5K11
IC9200
IC9201 74HC574
IC9203 HM84D
IC9206 PLS11815-50
C9600 220uF/16V
C9601 0uF1
C9604 0uF1
C9606 0uF1
C9608 0uF1
C9615 0uF1
C9616 220uF/16V
C9617 10uF/16V
C9618 0uF1
C9619 0uF1
C9621 0uF1
C9625 0uF1
C9628 0uF1
C9630 0uF1
IC9600 CY7C128
IC9601 74HC574
IC9603 CY7C128
IC9604 HM84D
IC9605 74HC574
IC9607 PLS11815-50
IC9608 HM85D
IC9609 GAL16V8-25
IC9610 74HC74
IC9611 74HC132
IC9690
IC9693
MOLEX6/8 J9600
VCC
GND
AGND
VDD
VSS
+5V
-5V
+12V
-12V
A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8

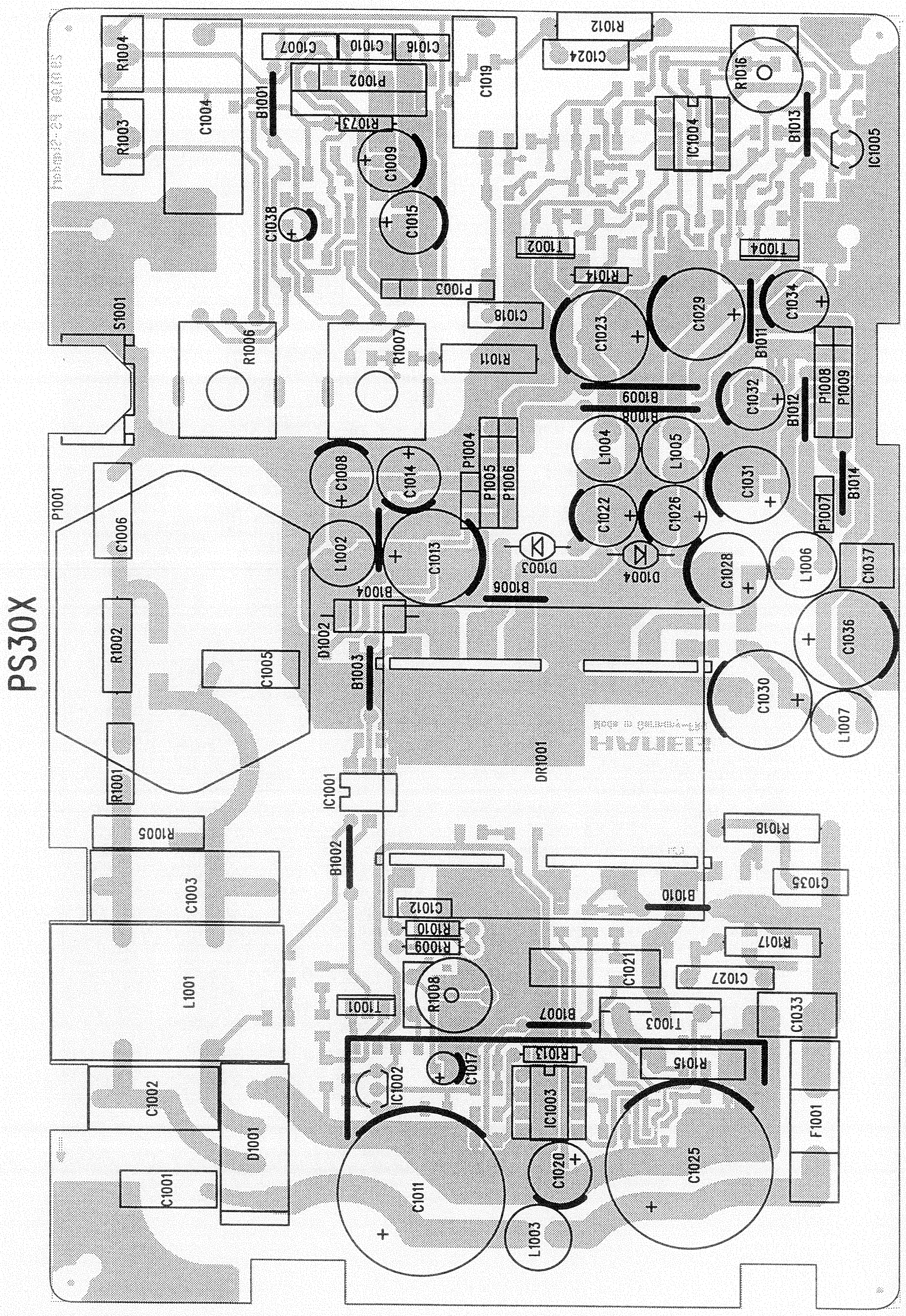
YPA Board (Topside)

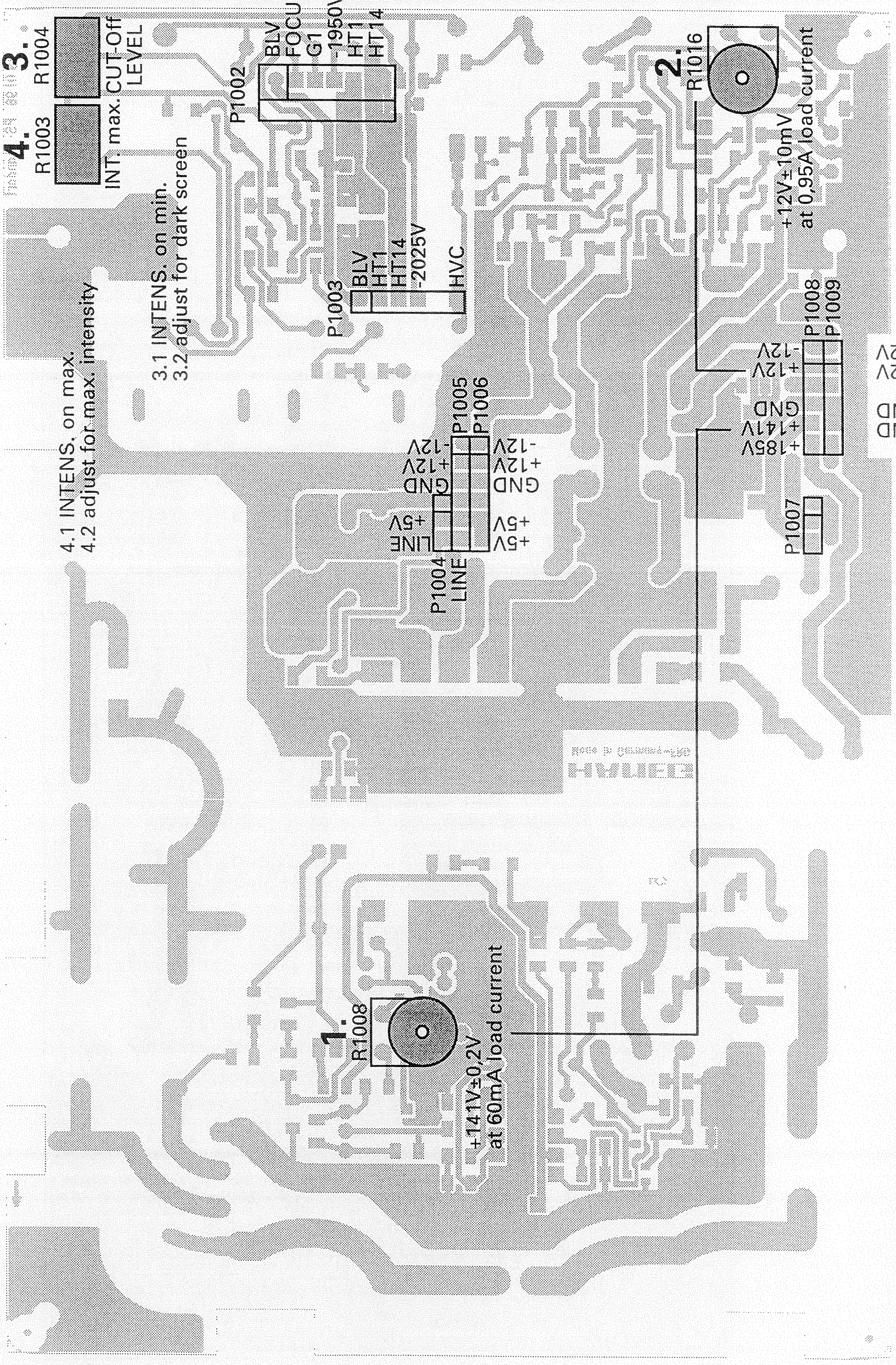


P601
W608
S605
S604
S603
IC603
C629
T611
C153
W603
W602
175mm
W607
HM303/305 YPA.4
C622
C626
C155
R640
C809
C616
R663
C620
R658
C611
30mm
DR6
DR5
W605
S601
IC601
T601
T602
165mm
W601
T603
T604
IC602
S602
DR3
DR4
W604
30mm
R712
R612
R624
R603
R714
R2
C149
IC103
R177
R203
C145
C601
R477
C445
R503
IC403
C449
R1
T119
T118
T117
R182
C148
C448
R482
T417
T418
T419
P100
C124
C134
C434
P400
C424
R134
C137
C128
T104
C154
C454
R122
R422
C428
T404
R434
C437
R139
D101
C131
C152
C452
D401
C431
R439
IC101
IC401
R120
R126
R426
R420
R117
R417
C111
RE102
C113
C120
C413
RE402
C411
C105
C102
R113
DR2
RE101
S104
S404
RE401
DR1
R413
C405
C402
DR7
C101
S103
S403
C401
DR8
S101
S102
S402
S401
CH I
CH II

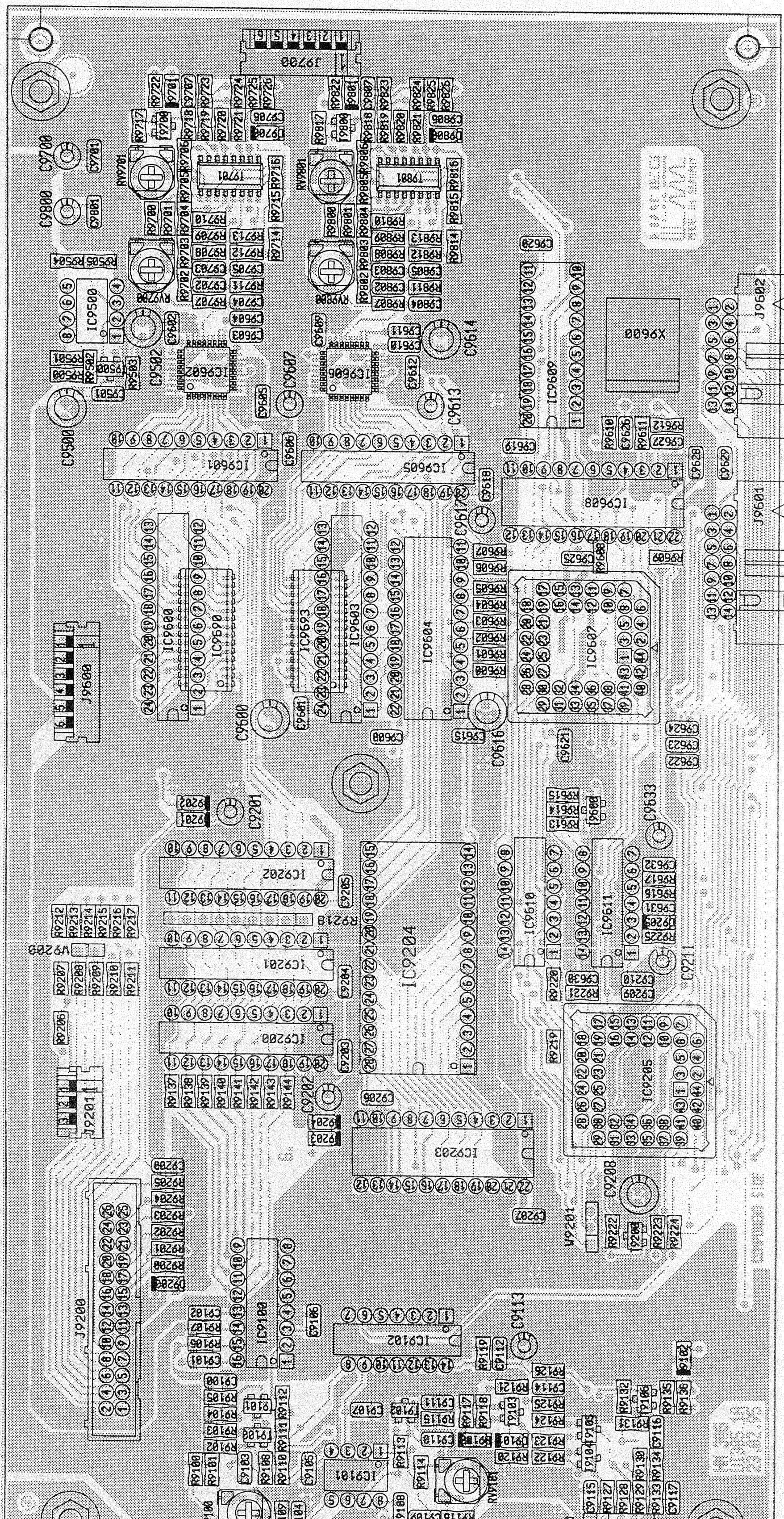


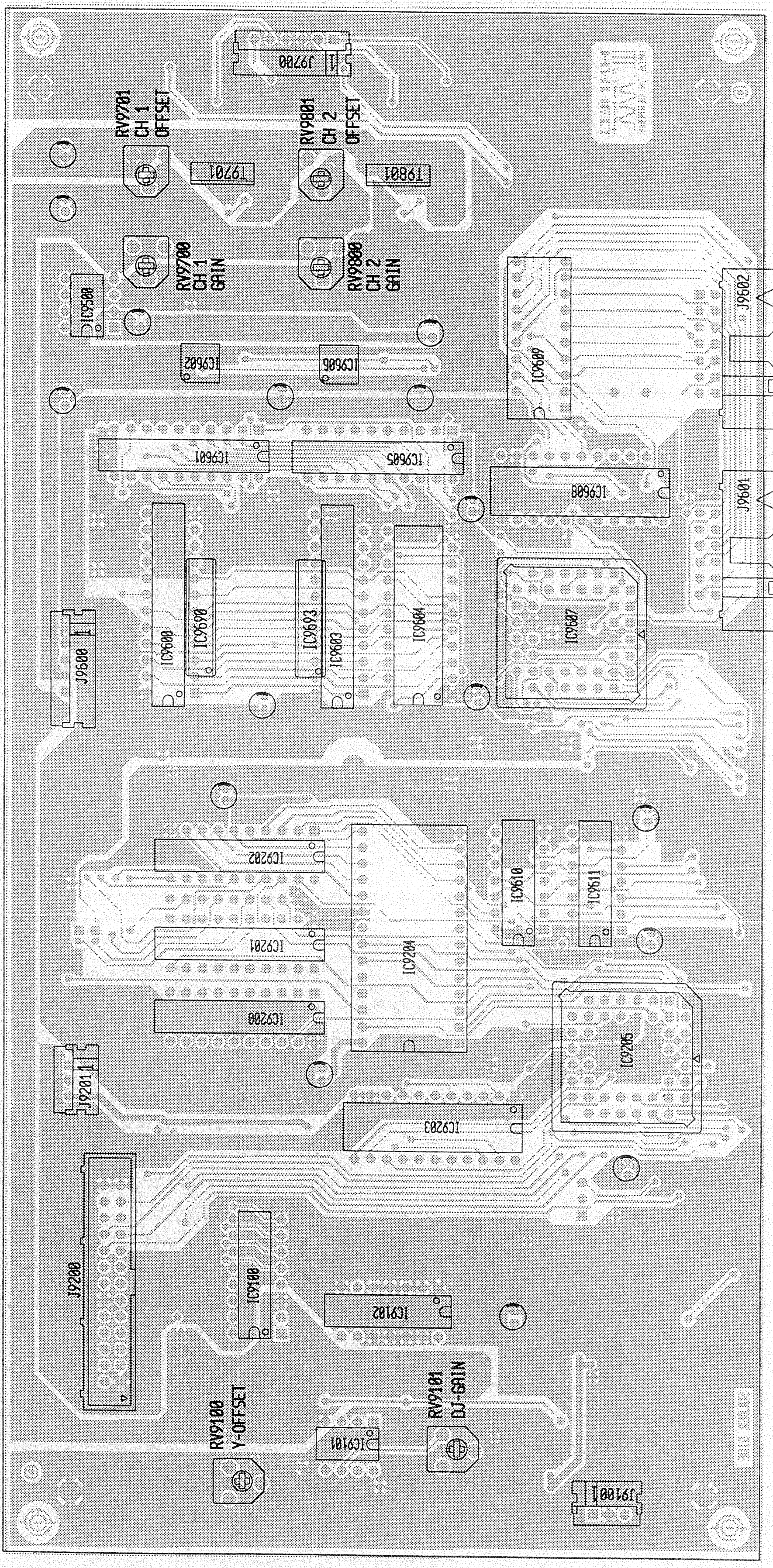
Power Supply Board (Topside)


PS30X
R1004
R1003
C1004
C1007
C1010
C1016
P1002
B1001
R1073
C1009
C1015
C1038
C1019
R1012
C1024
R1016
IC1004
B1013
IC1005
T1002
T1004
R1014
P1003
C1018
R1011
S1001
R1006
R1007
C1023
C1029
C1034
B1011
B1009
B1008
C1032
B1012
P1008
P1009
L1004
L1005
C1031
B1014
P1007
P1004
P1005
P1006
C1008
C1014
C1022
C1026
P1001
C1006
L1002
C1013
D1003
D1004
C1028
L1006
C1037
B1004
B1006
D1002
C1036
R1002
C1005
B1003
C1030
L1007
DR1001
R1001
IC1001
R1005
R1018
B1002
C1035
C1003
B1010
C1012
R1010
R1009
R1017
C1021
C1027
L1001
R1008
T1001
B1007
T1003
C1033
R1013
R1015
C1002
C1017
IC1002
IC1003
F1001
D1001
C1020
C1025
C1001
C1011
L1003

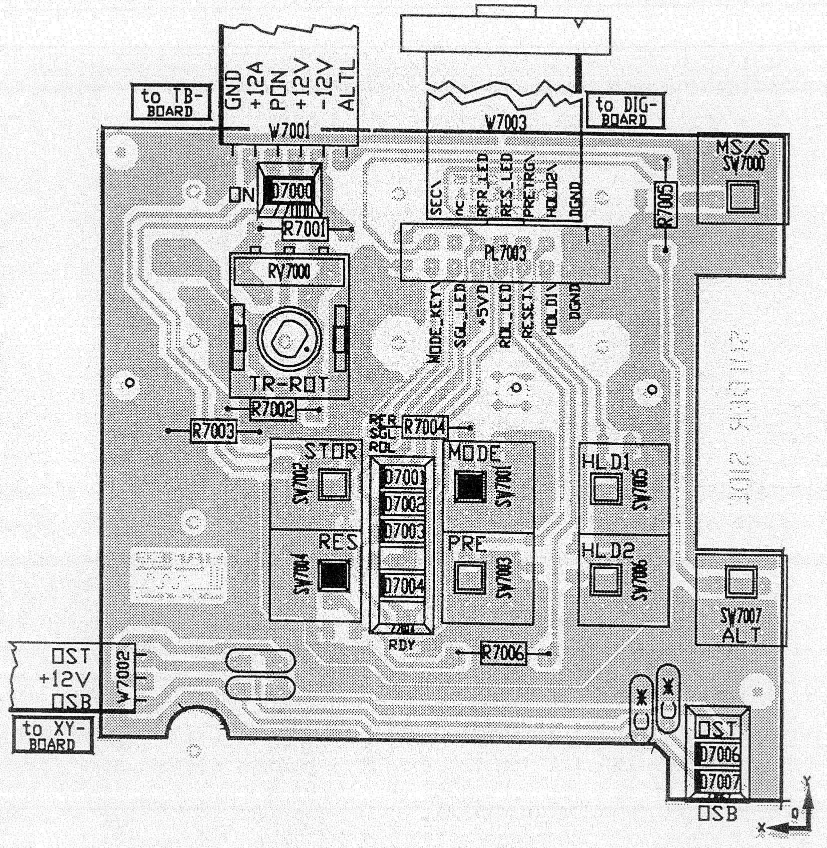

4.
R1003
INT. max.
3.
R1004
CUT-Off
LEVEL
4.1 INTENS. on max.
4.2 adjust for max. intensity
3.1 INTENS. on min.
3.2 adjust for dark screen
P1002
BLV
FOCUS
G1
-1950V
HT1
HT14
P1003
BLV
HT1
HT14
-2025V
HVC
P1005
P1006
-12V
+12V
GND
+5V
LINE
-12V
+12V
GND
+5V
+5V
P1004
LINE
2.
R1016
+12V±10mV
at 0,95A load current
P1008
P1009
-12V
+12V
GND
+141V
+185V
-12V
+12V
GND
GND
P1007
1.
R1008
+141V±0,2V
at 60mA load current

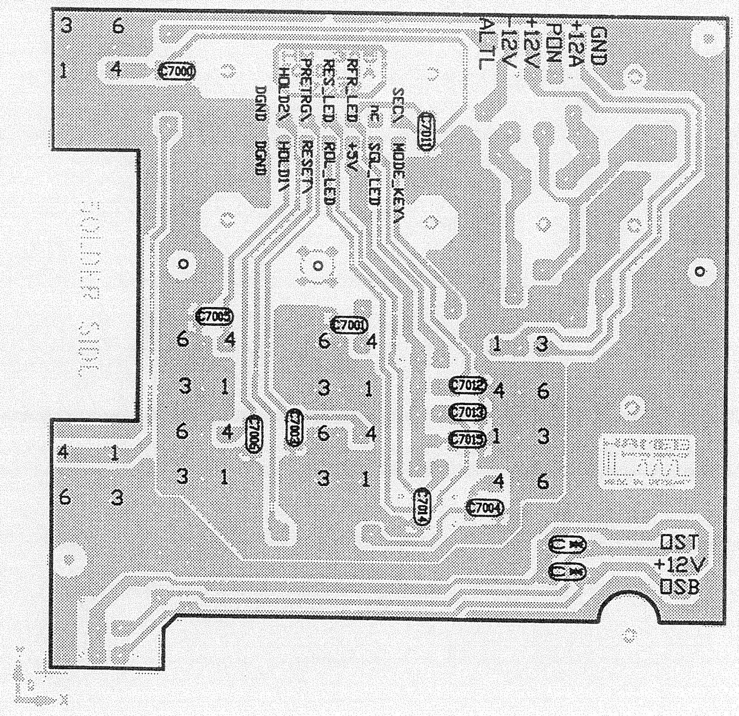
Digital Board (Topside)


J9700
IC9701
IC9801
RV9701
RV9801
RV9700
RV9800
C9700
C9800
IC9500
C9500
C9502
IC9602
IC9606
C9607
C9613
C9614
IC9601
IC9605
IC9609
XP9600
J9602
J9601
IC9608
IC9600
IC9690
IC9693
IC9603
IC9604
IC9607
J9600
C9600
C9616
C9633
C9201
IC9202
IC9201
IC9200
IC9204
IC9610
IC9611
C9211
V9200
J9201
C9202
IC9203
IC9205
C9208
V9201
J9200
IC9100
IC9102
C9113
IC9101
RV9100
RV9101
J9100

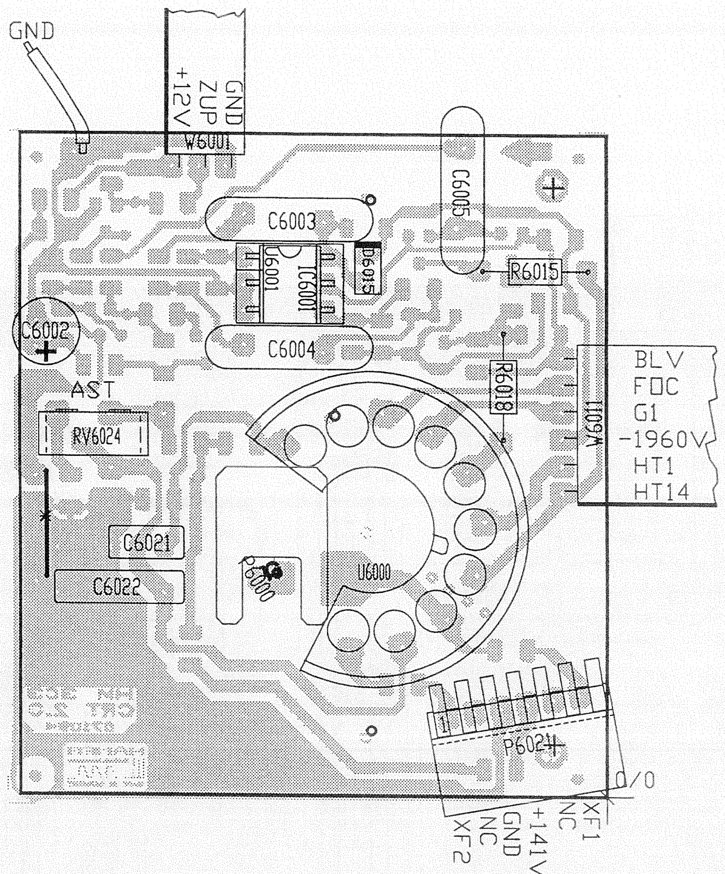

J9700
RV9701
CH 1
OFFSET
RV9801
CH 2
OFFSET
T9701
T9801
RV9700
CH 1
GAIN
RV9800
CH 2
GAIN
IC9500
IC9602
IC9606
IC9609
J9602
IC9601
IC9605
IC9608
J9601
IC9600
IC9690
IC9693
IC9603
IC9604
IC9607
J9600
IC9202
IC9610
IC9611
IC9201
IC9204
IC9200
IC9205
J9201
IC9203
J9200
IC9100
IC9102
RV9100
Y-OFFSET
RV9101
DJ-GAIN
IC9101
J9100

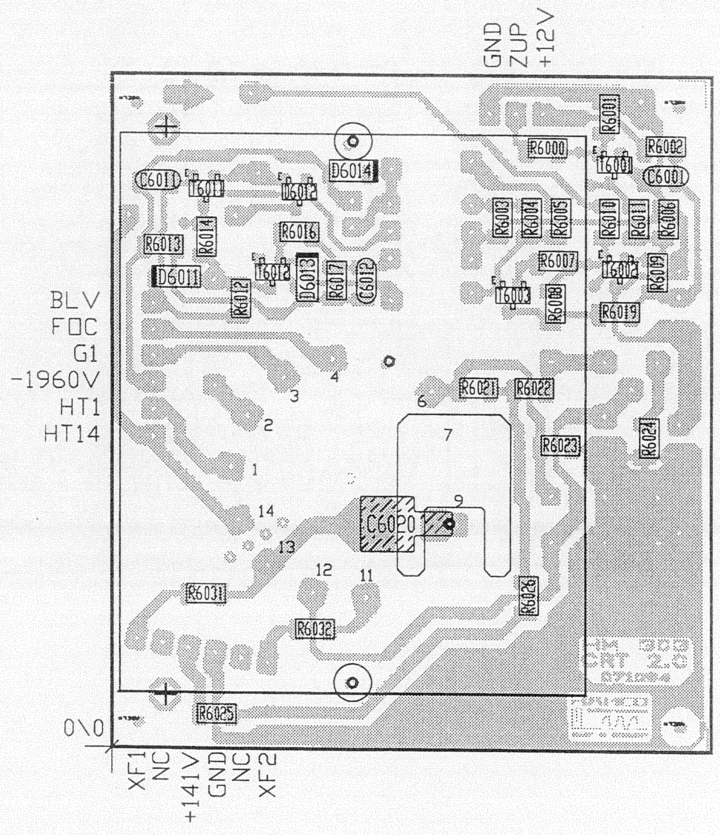
Front Controlboard (Topside, Bottomside)


to TB-
BOARD
GND
+12A
PON
+12V
-12V
ALTL
W7001
W7003
to DIG-
BOARD
MS/S
SW7000
SEC\
nc
RFR_LED
RES_LED
PRETRG\
HOLD2\
DGND
R7005
ON
D7000
R7001
PL7003
RV7000
MODE_KEY\
SGL_LED
+5VD
RDL_LED
RESET\
HOLD1\
DGND
TR-ROT
R7002
R7003
RFR
SGL
RDL
R7004
STOR
SW7002
D7001
D7002
D7003
D7004
MODE
SW7001
HLD1
SW7005
RES
SW7004
PRE
SW7003
HLD2
SW7006
SW7007
ALT
RDY
R7006
OST
+12V
OSB
W7002
to XY-
BOARD
OST
D7006
D7007
OSB
X
Y

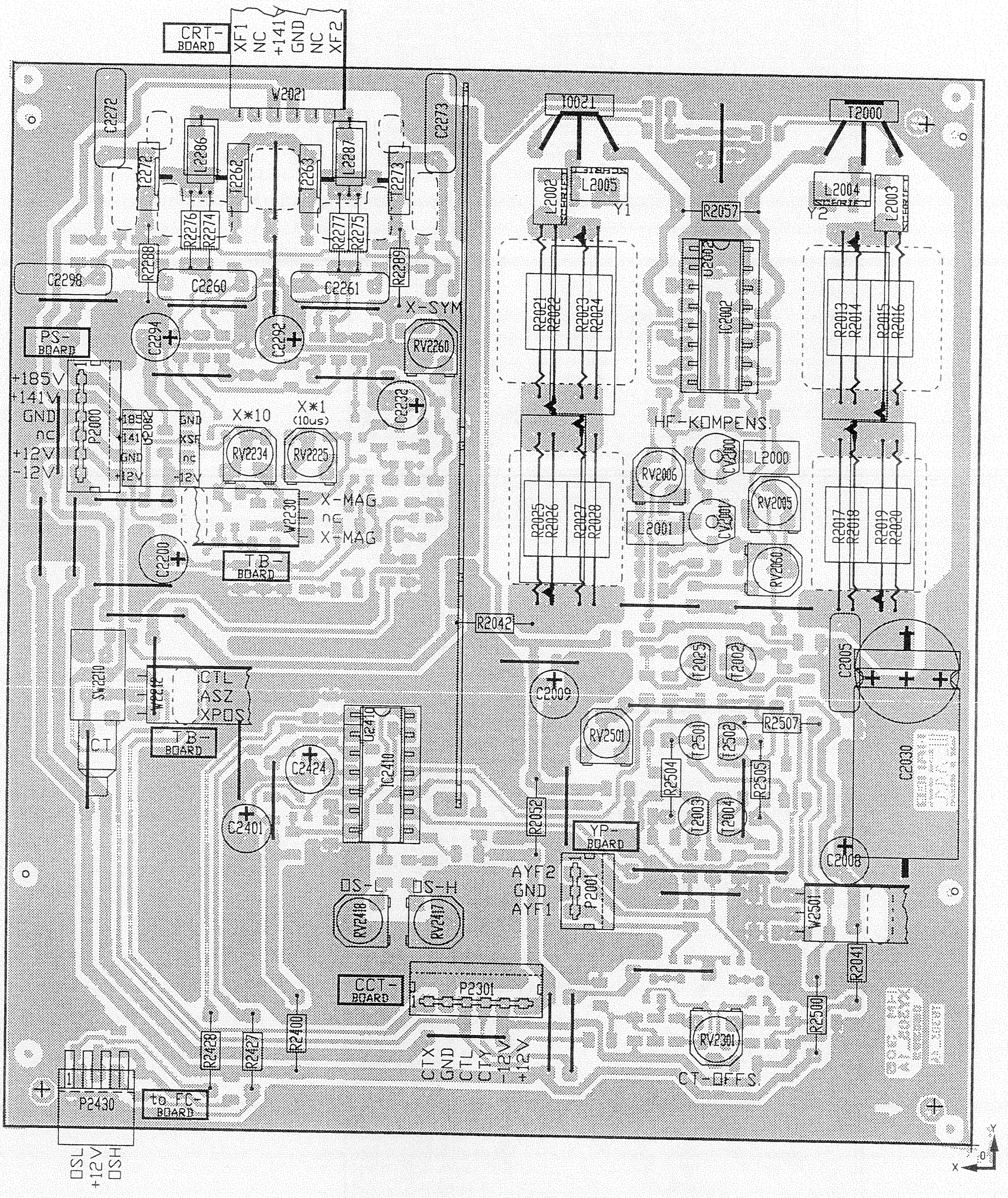

3
6
1
4
C7000
SEC\
nc
RFR_LED
RES_LED
PRETRG\
HOLD2\
DGND
MODE_KEY\
SGL_LED
+5V
RDL_LED
RESET\
HOLD1\
DGND
C7011
GND
+12A
PON
+12V
-12V
ALTL
C7005
C7001
C7012
C7013
C7015
C7006
C7003
C7014
C7004
OST
+12V
OSB
Y
X

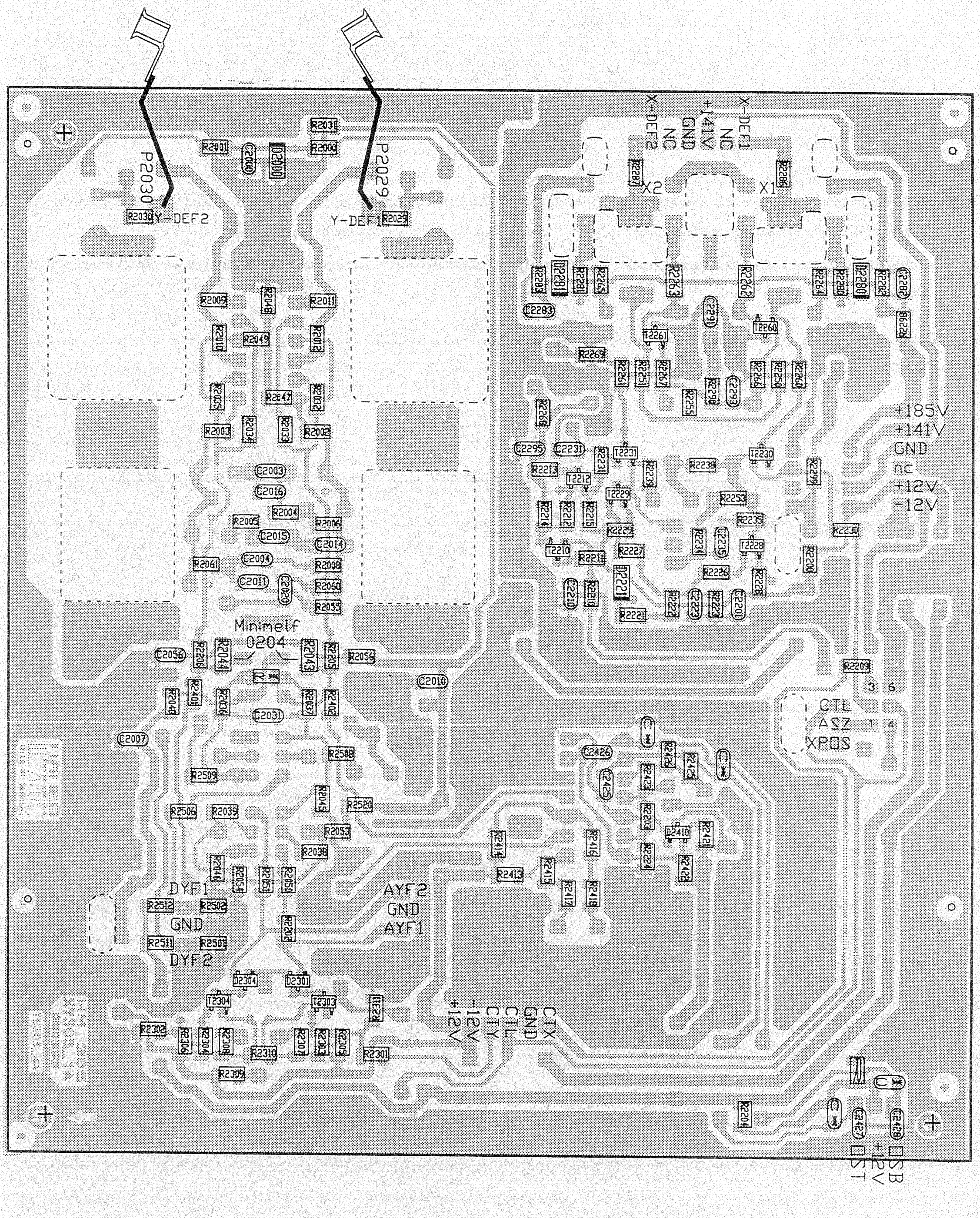
CRT Board (Topside, Bottomside)


GND
GND
ZUP
+12V
W6001
C6005
C6003
U6001
IC6001
D6015
R6015
C6002
C6004
R6018
W6011
BLV
FOC
G1
-1960V
HT1
HT14
AST
RV6024
C6021
C6022
P6000
U6000
P6021
1
0/0
XF1
NC
+141V
GND
NC
XF2

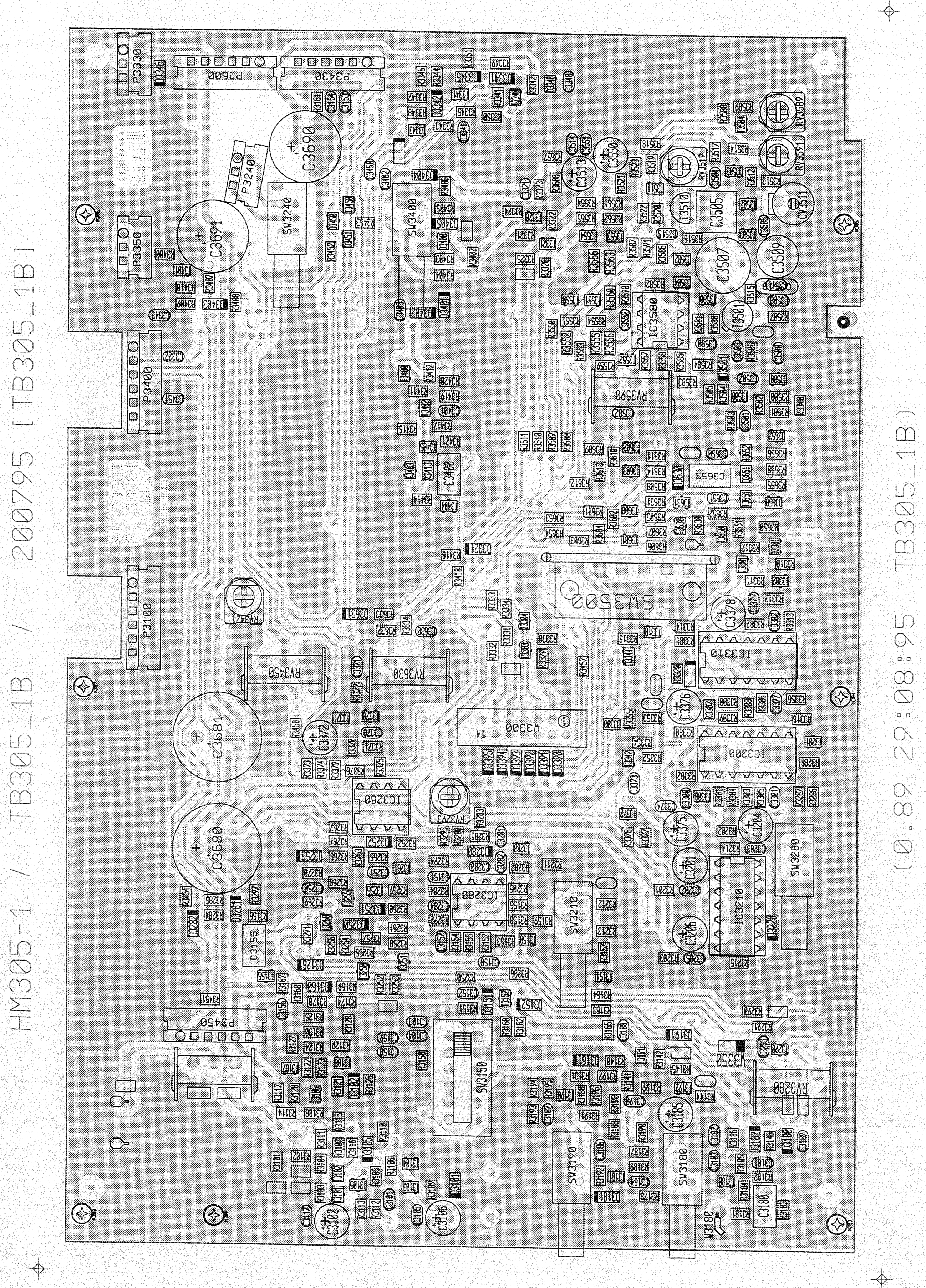

GND
ZUP
+12V
R6001
R6000
R6002
T6001
C6001
C6011
T6011
T6012
D6014
R6013
R6014
R6016
D6011
T6013
D6013
R6017
C6012
R6012
R6003
R6004
R6005
R6010
R6011
R6006
R6007
T6002
R6009
T6003
R6008
R6019
BLV
FOC
G1
-1960V
HT1
HT14
1
2
3
4
6
7
9
11
12
13
14
R6021
R6022
R6023
R6024
C6020
R6031
R6032
R6026
R6025
HM 305
CRT 2.0
0\0
XF1
NC
+141V
GND
NC
XF2

XY Board (Topside)

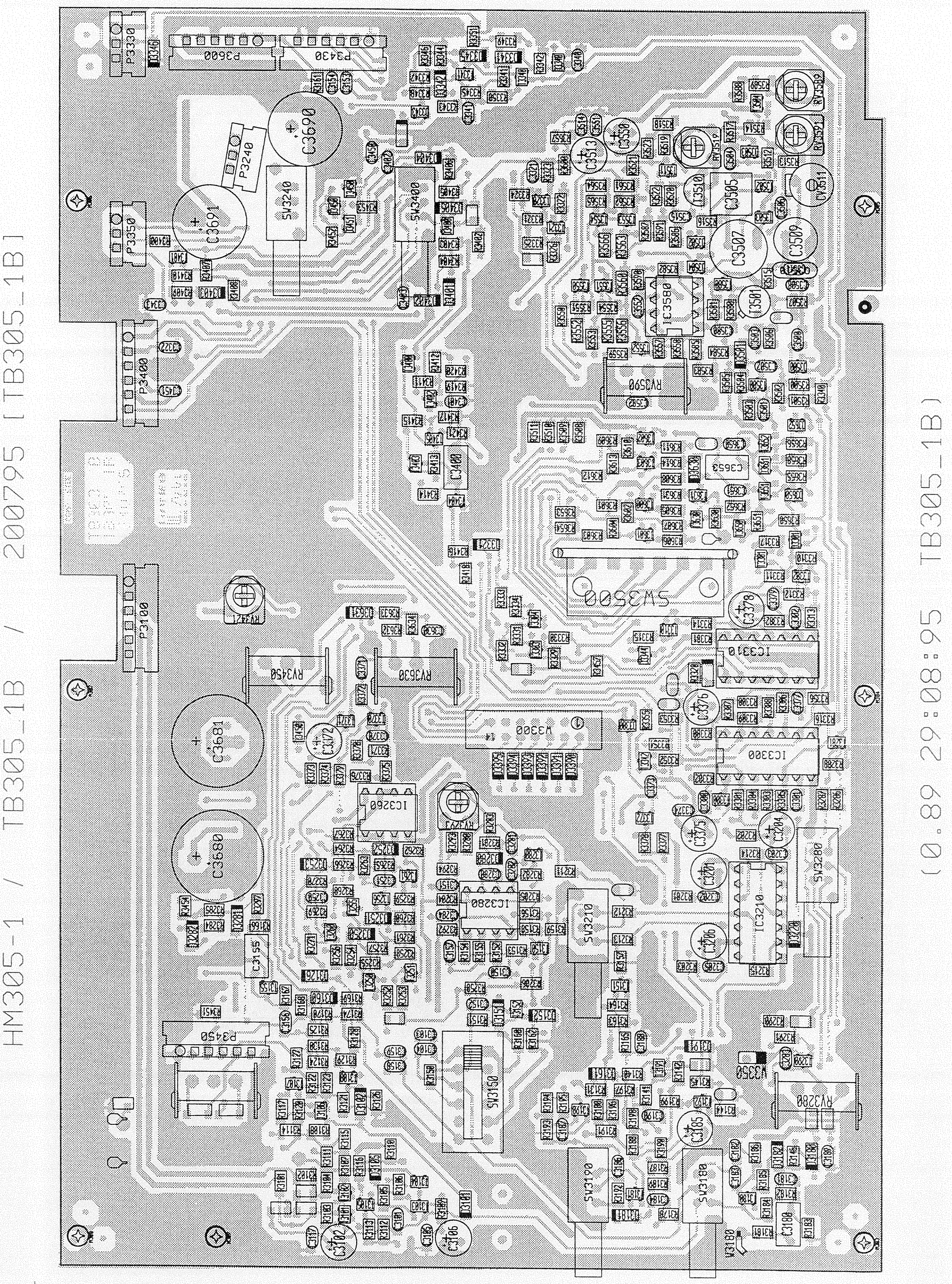

CRT-BOARD
XF1
NC
+141V
GND
NC
XF2
W2021
C2272
C2273
T2021
T2000
L2286
L2287
T2272
T2262
T2263
T2273
R2276
R2274
R2277
R2275
R2288
R2289
C2298
C2260
C2261
X-SYM
C2294
C2292
RV2260
PS-BOARD
+185V
+141V
GND
nc
+12V
-12V
P2000
X*10
X*1 (10us)
RV2234
RV2225
C2232
W2230
X-MAG
nc
X-MAG
C2200
TB-BOARD
L2002
L2005
Y1
R2057
L2004
Y2
L2003
R2021
R2022
R2023
R2024
IC2002
R2013
R2014
R2015
R2016
HF-KOMPENS.
CV2000
L2000
RV2006
RV2005
L2001
CV2001
R2025
R2026
R2027
R2028
R2017
R2018
R2019
R2020
R2042
T2025
T2002
C2005
C2009
RV2501
T2501
T2502
R2507
C2030
R2504
R2505
T2003
T2004
C2008
SW2210
W2212
CTL
ASZ
XPOS
TB-BOARD
CT
U2410
IC2410
C2424
C2401
R2052
YP-BOARD
AYF2
GND
AYF1
P2001
DS-L
DS-H
RV2418
RV2417
W2501
R2041
CCT-BOARD
P2301
R2500
RV2301
CT-OFFS.
CTX
GND
CTL
CTY
-12V
+12V
R2428
R2427
R2400
P2430
to FC-BOARD
DSL
+12V
DSH
X
Y
0


P2030
Y-DEF2
P2029
Y-DEF1
X-DEF1
NC
+141V
GND
NC
X-DEF2
X2
X1
+185V
+141V
GND
nc
+12V
-12V
Minimelf
0204
CTL
ASZ
XPOS
DYF1
GND
DYF2
AYF2
GND
AYF1
CTX
GND
CTL
CTY
-12V
+12V
SB
+12V
ST

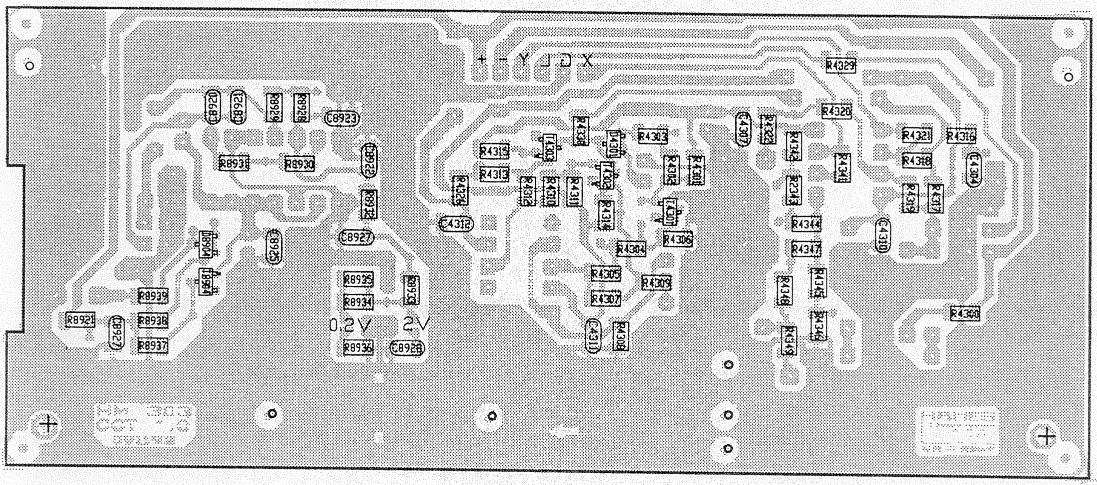
TB Board (Topside)

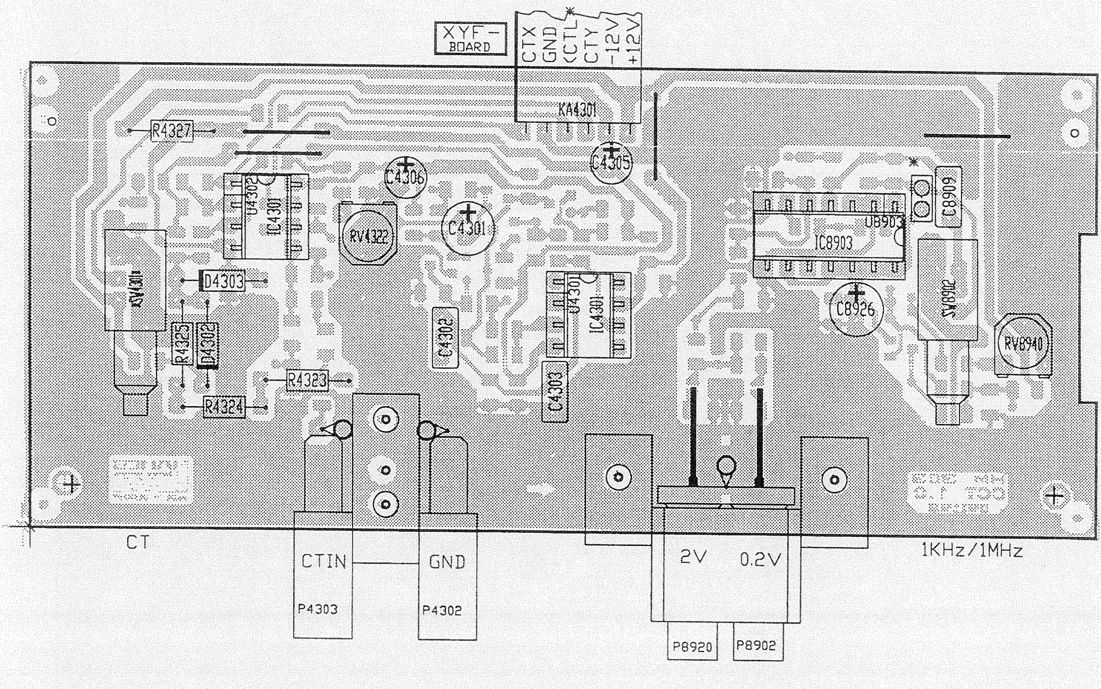

HM305-1 / TB305_1B / 200795 [TB305_1B]
(0.89 29:08:95 TB305_1B)
P3330
P3600
P3430
P3240
P3350
P3400
P3100
P3450
SW3240
SW3400
SW3500
SW3210
SW3150
SW3190
SW3180
SW3280
IC3580
IC3310
IC3300
IC3260
IC3280
IC3210
V3300
C3690
C3691
C3681
C3680
C3505
C3507
C3509
RV3590
RV3450
RV3630
RV3280

Änderungen vorbehalten / Subject to change without notice


HM305-1 / TB305_1B / 200795 [TB305_1B]
(0.89 29:08:95 TB305_1B)

CCT Board (Topside, Bottomside)


+ - Y ⊥ D X
R4329
R4320
R4321
R4316
R4318
R4319
R4317
R4341
R4342
R4343
R4344
R4347
R4345
R4346
R4348
R4349
R4303
R4302
R4301
R4306
R4304
R4305
R4307
R4309
R4308
R4310
R4311
R4312
R4313
R4314
R4315
R4326
R4328
R4308
C4312
C4311
C4310
C4307
C4304
C8920
C8922
C8923
C8924
C8925
C8927
C8928
C8929
R8928
R8929
R8930
R8931
R8932
R8933
R8934
R8935
R8936
R8937
R8938
R8939
R8925
0.2V
2V


XYF-
BOARD
CTX
GND
CTL
CTY
-12V
+12V
KA4301
R4327
C4306
C4305
C8909
U4302
IC4301
RV4322
C4301
UB903
IC8903
D4303
C8926
SW8902
U4301
IC4301
C4302
R4325
D4302
R4323
R4324
C4303
RV8940
CT
CTIN
GND
P4303
P4302
2V
0.2V
P8920
P8902
1KHz/1MHz

Adjustment Procedure

ADJUSTMENT PROCEDURE

Digital Storage Scope HM305

WARNING

The Instrument must be disconnected from the mains power supply whenever you open the case, repair or exchange parts.

HIGH VOLTAGE WARNING!

Hazardous High Voltage of up to 2,000 Volts is present inside this Instrument. The areas particularly affected by High Voltage are the high voltage circuit on the PS-board, the CRT-board and the CRT-socket.

SERVICE AND ADJUSTMENT

- of this instrument should only be performed in accordance and in conjunction with the operating manual and the WARNINGS contained therein.

- should only be performed by suitable qualified and experienced service personnel, or should be referred to one of the HAMEG companies listed on the rear cover of the manual.

Test Instruments required:

1) Scope Tester HZ60-2.
2) Constant amplitude sinewave generator, 20Hz - 250MHz, output 5mV - 5V into 50Ω, preferably with 20dB attenuation (e.g. HM8133, TEK SG502 + TEK SG503).
3) Amplitude Calibrator with 1kHz squarewave output and 600Ω impedance, risetime faster than 150ns.Output voltage 2mV - 20Volts in 1-2-5 sequence for 4 divisions display amplitude (e.g. HZ62, TEK PG506).
4) Time mark generator from 5ns/div to 5s/div. Output min. 10mV into 50Ω (e.g. HZ62, TEK TG501).
5) Pre-attenuator 2:1 (1MΩ , 12-48pF), e.g. HZ20.
6) 50Ω BNC through termination, e.g. HZ22.
7) 2 BNC-cables, 50Ω, e.g. HZ34.
8) BNC-T-connector.
9) Oscilloscope probe 10:1, with exactly 9MΩ series resistance and compensated for test oscilloscope mentioned under 10).
10) Oscilloscope 100MHz, 5mV/div to 5V/div, e.g. HM1005.
11) Trimming/adjusting tool.
12) Variable output safety insulation transformer.
13) Video signal generator with positive and negative signal output.
14) Yt-EPROM HM1007.

This procedure covers all adjustments and the most important - but not all - performance checks. The correct sequence of all adjustment steps must be strictly followed.

Exact adjustment is only possible when any influence of the earths' magnetic field has been compensated with the trimmer marked TR (trace rotation).

All adjustments should only be performed by qualified and experienced personnel. This is particularly important for adjustments in the high voltage section of the instrument.

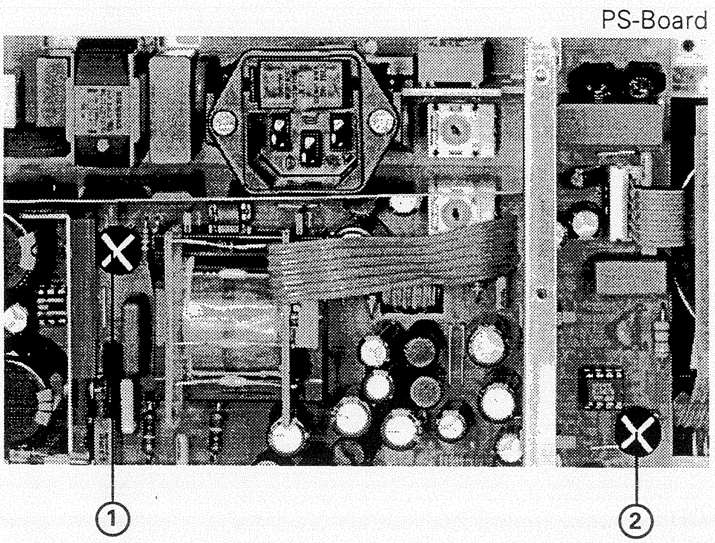
1) R1008: +141 Volt supply. 35
2) R1016: +12 Volt supply. 35
3) RV7000: Trace Rotation Check. 35
4) R1004 : CRT minimum intensity. 35
5) R1003 : CRT maximum intensity. 35
6) R712: Mean Y-plate Potential Channel I. 35
7) R714: Mean Y-plate Potential Channel II. 37
8) RV6021 : Astigmatism correction. 37
9) R640: Y-Gain CH I. 37
10) R122: FET operating point CH I. 37
11) R203: Invert-Balance CH I. 37
12) R177: Variable-Balance CH I. 37
13) R139: 100Hz Squarewave 5mV/div CH I. 38
14) R134: 100Hz Squarewave 1mV/div Adjustment CH I. 39
15) R658: Y-Gain CH II. 39
16) R422: FET operating point CH II. 39
17) R503: Invert-Balance CH II. 39
18) R477: Variable-Balance CH I. 39
19) R439: 100Hz Squarewave 5mV/div CH II. 39
20) R434: 100Hz Squarewave 1mV/div CH II. 39
21) RV2005 (A), RV2006 (C), CV2000 (D) and CV2001 (B): 41
22) Y-Amplifier Bandwidth Check. 41
23) C111 (A)/113 (B)/102 (C)/105 (D):Attenuator Compensation CH I. 41
24) C411 (A)/413 (B)/402 (C)/405 (D): Attenuator Compensation CH II. 41
25) RV2501 (A): Storage Mode Y-Gain 43
26) RV9101: Dot-Join Overshoot 43
27) RV9700 (A), RV9701 (B): Digital Y-Gain/Offset CH I. 43
28) RV9800 (A), RV9801 (B): Digital Y-Gain/Offset CH II. 43
29) R663: Digital ADDition/Offset. 45
30) RV2417 (A), RV2418 (B): Overscan. 45
31) RV3421 (A), RV2225 (B): Digital Time Base Adjustment. 45
32) RV3519 (A)/3589 (B)/3591 (C), CV3511 (D): Analogue Time Base. 45
33) RV2234: X-Magnification x10. 47
34) RV2260: X-Amplifier Symmetry 47
35) R624: XY-Gain 47
36) RV3293: Trigger-Symmetry 47
37) R612: DC-Triggering CH I. 47
38) R603: DC-Triggering CH II. 47
39) RV2301 (A), RV4322 (B): Component Tester Y-Position and Tilt. 49
40) RV8940: Calibrator Output. 49
41) Trigger Filter Check. 49
42) Triggerbandwidth Check. 49
43) External Trigger Check. 49
44) Video Trigger Check. 50
45) Pretrigger Check. 50
46) Interface Connector Check. 50
Writing data into memory 51

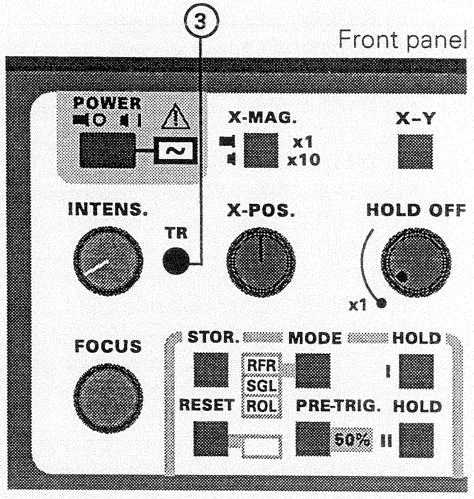
NOTE

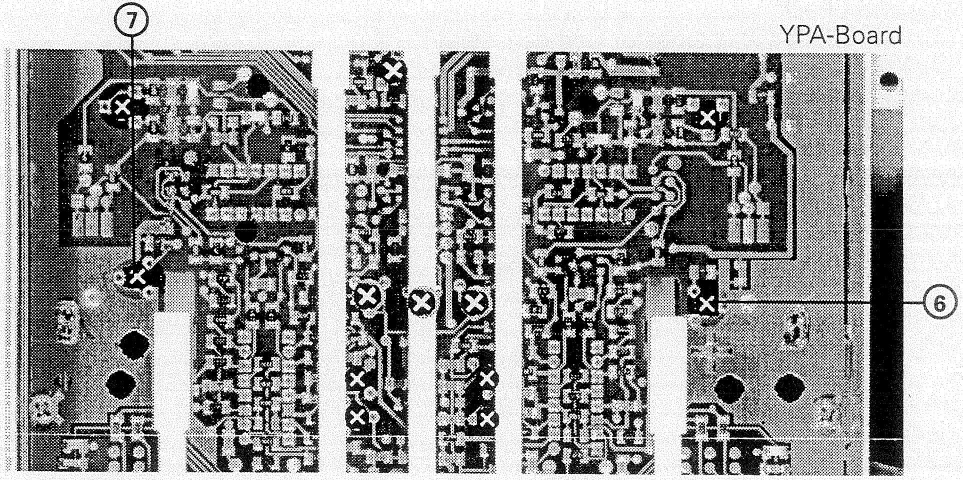
The adjustment procedures assume that the instrument had once been properly adjusted in the factory and adjustments are required due to temperature drift or the replacement of defective components.

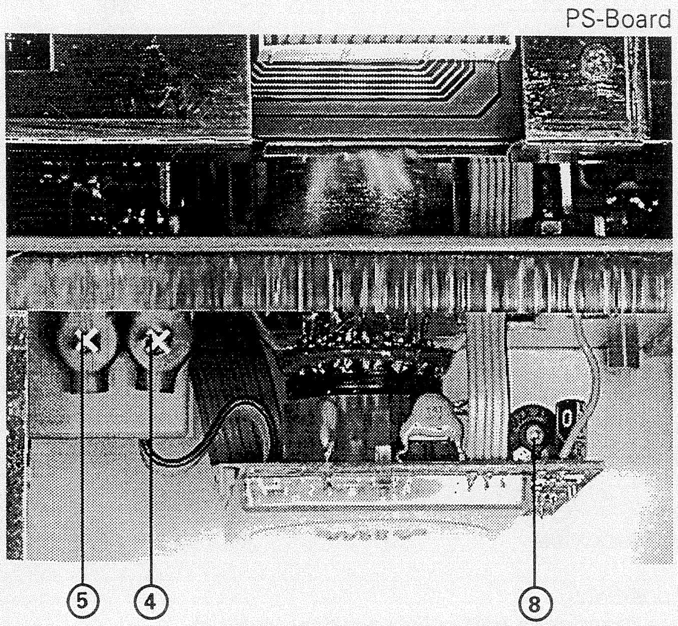
Before starting each adjustment procedure, set the oscilloscope to the following basic settings:

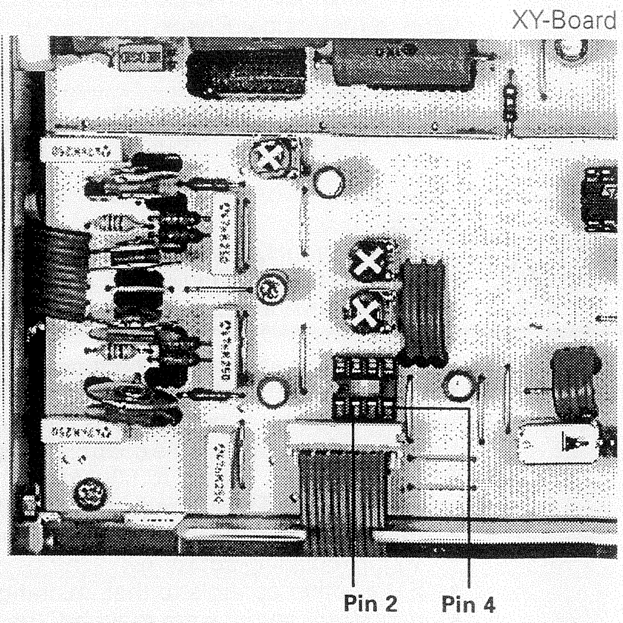
- Press POWER pushbutton (in!).
- Release all other pushbuttons (out!) except AC/DC input coupling.
- Rotate the three variable controls (TIME/DIV. and VOLTS/DIV.) to their (calibrated) detent positions.
- Set TIME/DIV. switch to 50µs/div.
- Set both VOLTS/DIV switches to 5mV/div.
- Rotate the HOLD OFF knob fully counterclockwise.
- Trigger coupling set to AC.
- Set all other controls to their midrange positions.
- If different settings are required, they are mentioned particularly for each subject.


PS-Board
1
2


3
Front panel
POWER
X-MAG.
x1
x10
X-Y
INTENS.
TR
X-POS.
HOLD OFF
x1
FOCUS
STOR.
MODE
HOLD
RFR
SGL
ROL
I
RESET
PRE-TRIG.
HOLD
50%
II


7
YPA-Board
6


PS-Board
5
4
8


XY-Board
Pin 2
Pin 4

(1) R1008: +141 Volt supply.

WARNING: *To avoid damage use a fully insulated screwdriver!*

Locate and identify R1008 (1) on PS-Board (screened section).
Locate 8 pole checkpoint socket on XY-Board and identify pin 2.
Adjust R1008 (1) for exactly +141 Volts (± 0.1 Volt) in respect to ground.

(2) R1016: +12 Volt supply.

Locate and identify R1016 (2) on PS-Board.
Locate 8 pole checkpoint socket on XY-Board and identify pin 4.
Adjust R1016 (2) for exactly +12Volts (± 10mV) in respect to ground.
All other voltages +185V (pin 1), -12V (pin 5) and -1950V on cathode of CRT depend on the correct +12Volt adjustment.
All these voltages must be checked and verified.

(3) RV7000: Trace Rotation Check.

Locate and identify RV7000 (3) „TR" on front panel.
Using Y-Pos.I and X-Pos. controls, move baseline to the center of the graticule.
Press channel I GD pushbutton (in!).
When turning RV7000 (3), check that the range of inclination of the baseline is at least 1mm at both horizontal limits of the graticule.
Readjust baseline exactly parallel to the horizontal center line of the graticule.

(4) R1004 : CRT minimum intensity.

Locate and identify R1004 (4) on PS-Board.
Set INTENS. control to fully left position.
Press XY pushbutton (in!).
Adjust R1004 (4) so that the dot just disappears.
Release XY pushbutton.

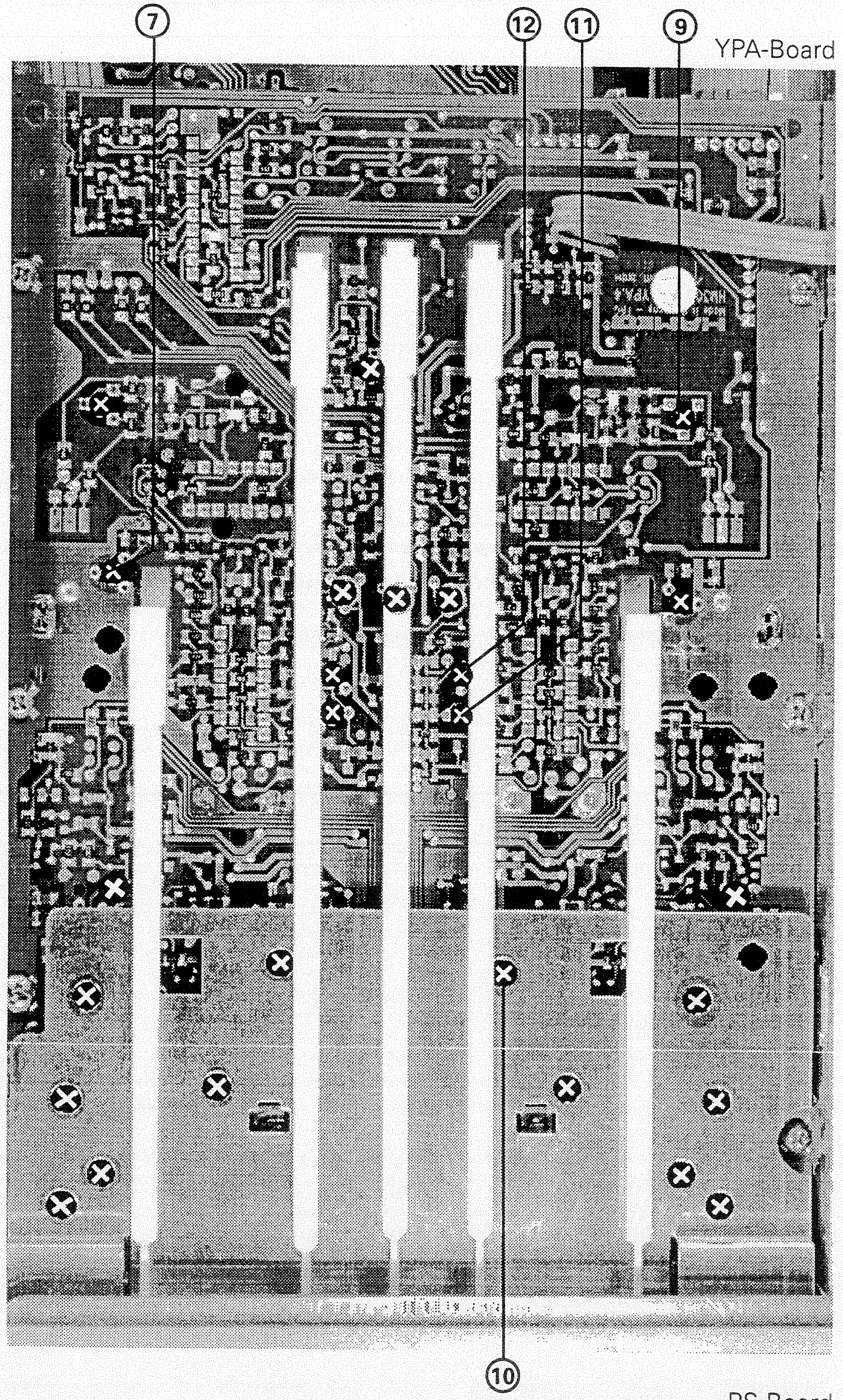
(5) R1003 : CRT maximum intensity.

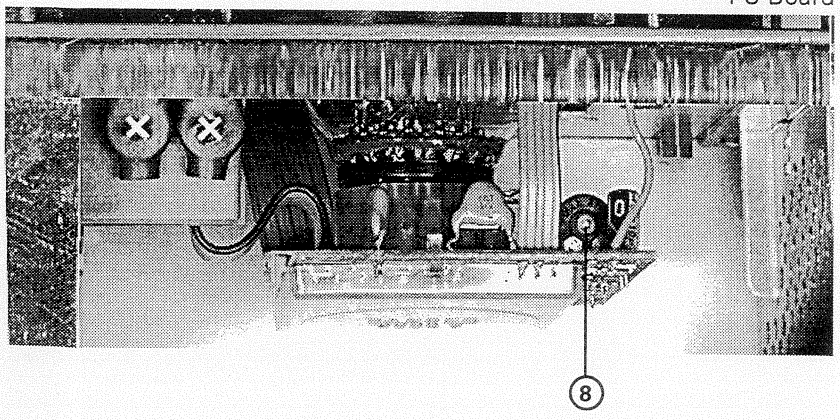
Locate and identify R1003 (5) on PS-Board.
Set INTENS. control to fully right position.
Set FOCUS control for optimum sharpness.
Adjust R1003 (5) so that the beam diameter is 1.5mm.
Repeat adjustment (4) and (5) until optimum is obtained!

(6) R712: Mean Y-plate Potential Channel I.

Locate and identify R712 (6) on YPA-Board.
Press DUAL pushbutton (in!).
Set both beams to the horizontal center of the graticule by using Y-POS. I and Y-POS.
This settings must not be changed during until item 6) and 7) are finished.
Release DUAL pushbutton (out!) - channel I mode -.
Switch the oscilloscope OFF.
Locate and identify both lines from the Y-final amplifier to the Y-plates of the CRT.
Connect both lines galvanically (short).
Switch the oscilloscope ON.
Measure the DC voltage at the Y-plates in respect to ground.
Adjust R712 (6) for +85Volt Y-plate voltage.

Note: *Do not remove the short at the Y-plates until item 7) is finished.*


⑦
⑫
⑪
⑨
YPA-Board
⑩


PS-Board
⑧

(7) R714: Mean Y-plate Potential Channel II.

Locate and identify R714 (7) on YPA-Board.
Press CH I/II pushbutton (in!) for channel II mode.
Measure the DC voltage at the Y-plates in respect to ground.
Adjust R714 (7) for +85Volt Y-plate voltage.
Switch the instrument OFF.
Remove the connection between both Y-plates.
Switch instrument ON.

(8) RV6021 : Astigmatism correction.

Locate and identify RV6021 (8) on CRT-Board.
Connect a 1MHz squarewave signal with 25mVpp at 50Ω (HZ22) to input CHI.
Set time base to 1µs/div.
Adjust FOCUS control for optimum sharpness.
Adjust RV6021 (8) until leading edge and top of signal have equal sharpness.
Recheck range of FOCUS control.
Adjust FOCUS control for optimum sharpness.

(9) R640: Y-Gain CH I.

Locate and identify R640 (9) on YPA-Board.
Connect a 25mV/1kHz squarewave signal via 50Ω cable and 50Ω through terminator to input channel I.
Set time base to 1ms/div.
Adjust R640 (9) for 5 division signal height.

(10) R122: FET operating point CH I.

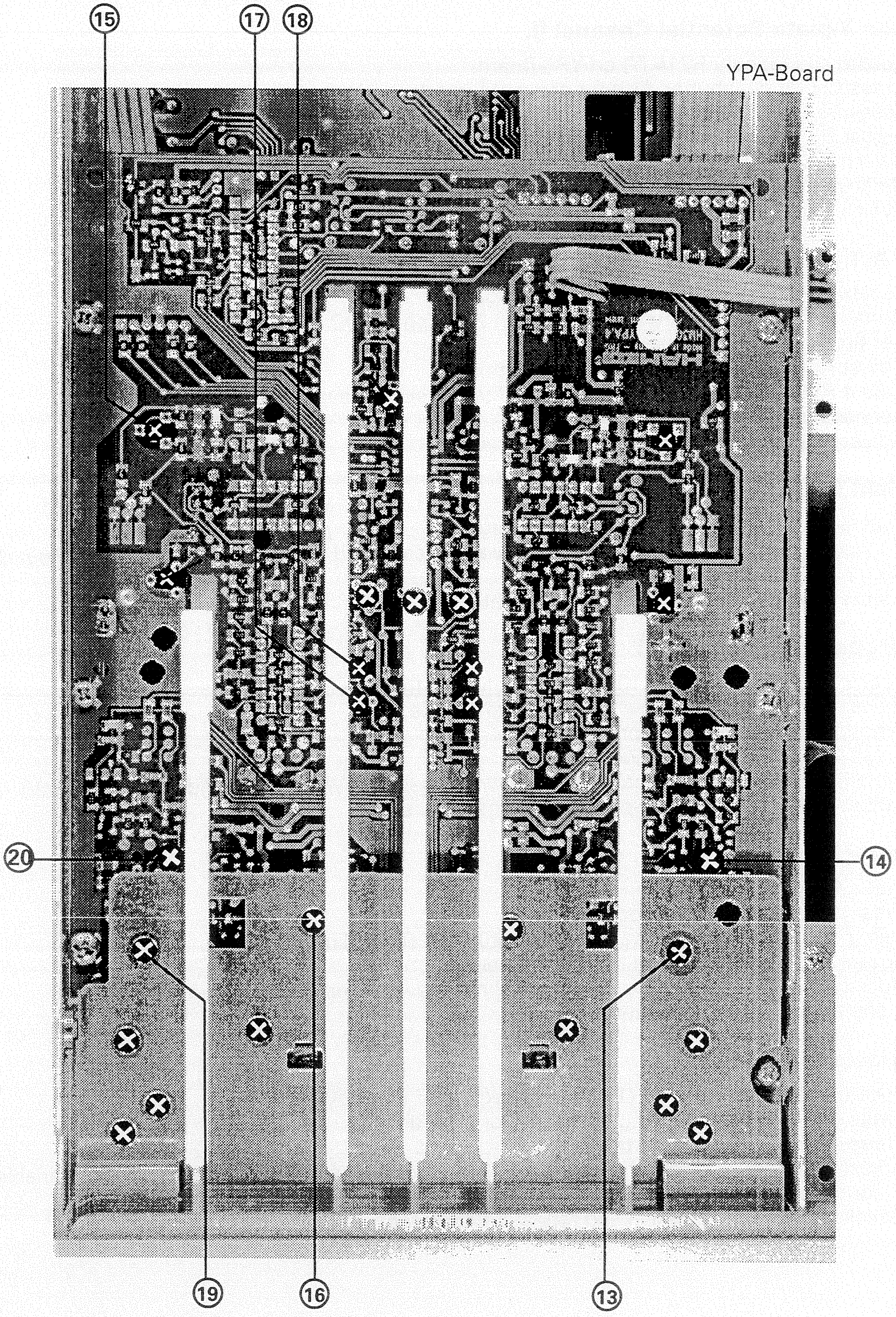
Locate and identify R122 (10) in CH I section of the YPA-Board.
Release all pushbuttons (out!) for channel I mode.
Press Y x5 channel I (in!) for 1mV/div.
Press GD pushbutton channel I (in!).
Switch the attenuator channel I constantly between 5mV/div (1mV) and 10mV/div (2mV).
Adjust R122 (10) until no Y-position change occurs.

(11) R203: Invert-Balance CH I.

Press GD pushbutton channel I (in!).
Press Y x5 channel I (in!) for 1mV/div.
Using Y-POS.I control set trace to the horizontal center line.
Locate and identify R203 (11) on YPA-Board.
Adjust R203 (11) so that the baseline will not move, when pressing and releasing the INVERT CH I pushbutton.

(12) R177: Variable-Balance CH I.

Locate and identify VR177 (12) in CH I section of the YPA-Board.
Press channel I Y-MAG. x5 pushbutton for 1mV/div.
Press channel I GD pushbutton (in!).
Adjust VR177 (12) so that the baseline will not move when turning the channel I Y-variable control through the entire range.
Check adjustment 11) again and repeat it if required.



(13) R139: 100Hz Squarewave 5mV/div CH I.

Locate and identify R139 (13) in CH I section of the YPA-Board.
Connect a 25mV/100Hz squarewave signal via 50Ω cable and 50Ω through terminator to input channel I.
Set time base to 2ms/div.
Check that DC input coupling is selected.
Adjust R139 (13) for flat top.

(14) R134: 100Hz Squarewave 1mV/div Adjustment CH I.

Locate and identify R134 (14) in CH I section of the YPA-Board.
Connect a 5mV/100Hz squarewave signal via 50Ω cable and 50Ω through terminator to input channel I.
Press Y x 5 channel I (in!) for 1mV/div.
Set time base to 2ms/div.
Check that DC input coupling is selected.
Adjust R134 (14) for flat top.

(15) R658: Y-Gain CH II.

Locate and identify R658 (15) on YPA-Board.
Connect a 25mV/1kHz squarewave signal via 50Ω cable and 50Ω through terminator to input channel II.
Set input coupling to DC.
Set time base to 1ms/div.
Adjust R658 (15) for 5 division signal height.

(16) R422: FET operating point CH II.

Locate and identify R422 (16) in CH II section of the YPA-Board.
Press CHI/II pushbutton (in!) for channel II mode.
Press Y x5 channel II (in!) for 1mV/div.
Press GD pushbutton channel II (in!).
Switch the attenuator channel II constantly between 5mV/div (1mV) and 10mV/div (2mV).
Adjust R422 (16) until no Y-position change occurs.

(17) R503: Invert-Balance CH II.

Press GD pushbutton channel II (in!).
Press Y x5 channel II (in!) for 1mV/div.
Using Y-POS.II control set trace to the horizontal center line.
Locate and identify R503 (17) on YPA-Board.
Adjust R503 (17) so that the baseline will not move, when pressing and releasing the INVERT CH II pushbutton.

(18) R477: Variable-Balance CH II.

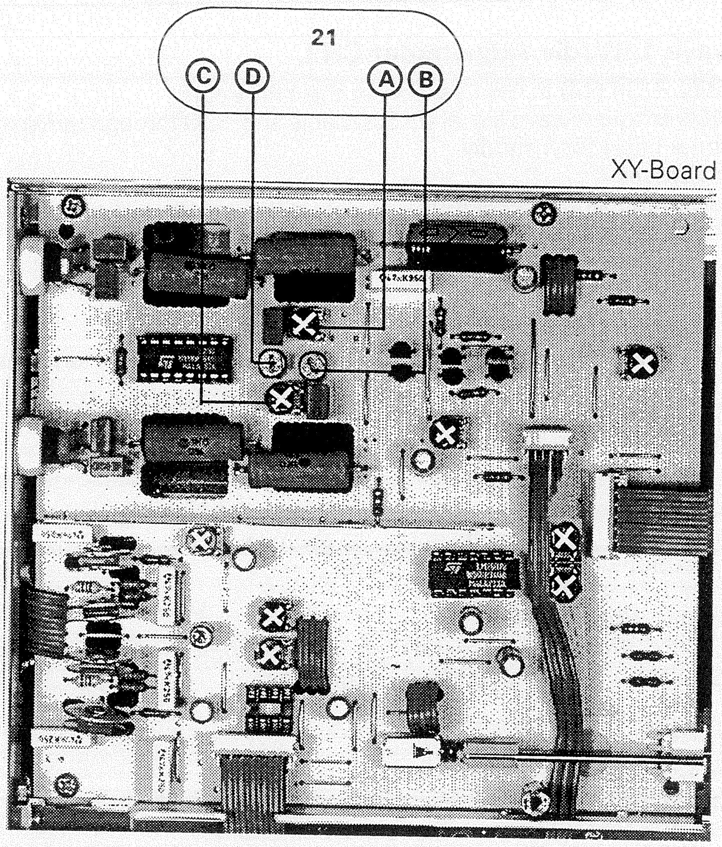
Locate and identify VR477 (18) in CH II section of the YPA-Board.
Press channel II Y-MAG. x5 pushbutton for 1mV/div.
Press channel II GD pushbutton (in!).
Adjust VR477 (18) so that the baseline will not move when turning the channel II Y-variable control through the entire range.
Check adjustment 17) again and repeat it if required.

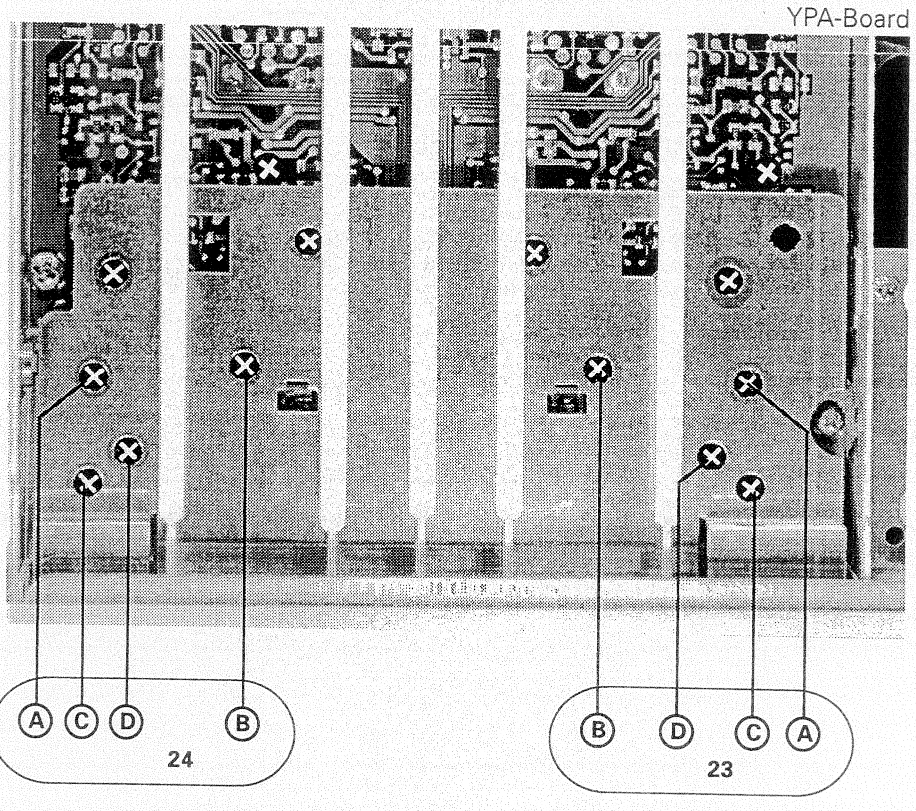
(19) R439: 100Hz Squarewave 5mV/div CH II.

Locate and identify R439 (19) in CH II section of the YPA-Board.
Connect a 25mV/100Hz squarewave signal via 50Ω cable and 50Ω through terminator to input channel II.
Set time base to 2ms/div.
Check that DC input coupling is selected.
Adjust R439 (19) for flat top.

(20) R434: 100Hz Squarewave 1mV/div CH II.

Locate and identify R434 (20) in CH II section of the YPA-Board.
Connect a 5mV/100Hz squarewave signal via 50Ω cable and 50Ω through terminator to input channel II.
Press Y x 5 channel II (in!) for 1mV/div.
Set time base to 2ms/div.
Check that DC input coupling is selected.
Adjust R434 (20) for flat top.


21
C
D
A
B
XY-Board


YPA-Board
A
C
D
B
24
B
D
C
A
23

(21) RV2005 (A), RV2006 (C), CV2000 (D) and CV2001 (B): Y-Final Amplifier.

Connect a 1MHz squarewave signal of 25mV via 50Ω cable and 50Ω throughtermination to input CH I.
Check that DC input coupling is selected.
Set time base to 0.2µs/div.
Locate and identify RV2005, RV2006, CV2000 and CV2001 on XY-Board.
As the capacitive influence of the cabinet is of importance, a metal sheet above the Y-final amplifier section is required.
Adjust RV2005 (21A) and CV2001 (21B) for flat top, RV2006 (21C) and CV2000 (21D) for fast leading edge with minimum overshoot.
Repeat until optimum is obtained.
Check channel II under the same conditions.

(22) Y-Amplifier Bandwidth Check.

Connect a 40mVpp/50kHz sinewave signal from a constant amplitude generator via a 50Ω throughtermination to the input of channel I.
Adjust the generator amplitude for 8 div. display height on the screen.
Increase the generator frequency until the signal is displayed with 5.6 div. height (-3dB).
Repeat the adjustment under item 21), if the frequency reading on the generator shows a value less than 30MHz.
Press CHI/II-TRIGI/II pushbutton (in!).
Connect a 40mVpp/50kHz sinewave signal from a constant amplitude generator via a 50Ω throughtermination to the input of channel II.
Adjust the generator amplitude for 8 div. signal height displayed on the screen.
Increase the generator frequency until the signal is displayed with 5.6 div. height (-3dB).
Repeat the adjustments under item 21), if the frequency reading on the generator shows a value less than 30MHz.

(23) C111 (A)/113 (B)/102 (C)/105 (D):Attenuator Compensation CH I.

Locate and identify trimmers VC102-113 for CH I on YPA-Board.
Check that DC input coupling is selected.
Set amplitude calibrator to 1kHz and connect a 2:1 pre-attenuator via 50Ω cable to input of CH I.
Set calibrator output voltage to 80mVpp (40mVpp at the 2:1 pre-attenuator output, if terminated with 1MΩ).
Check that input attenuator CH I is set to 5mV/div.
Adjust trimmer in pre-attenuator for flat squarewave top. This adjustment must not be changed during the following procedure.
Adjust compensation as listed in the table below:

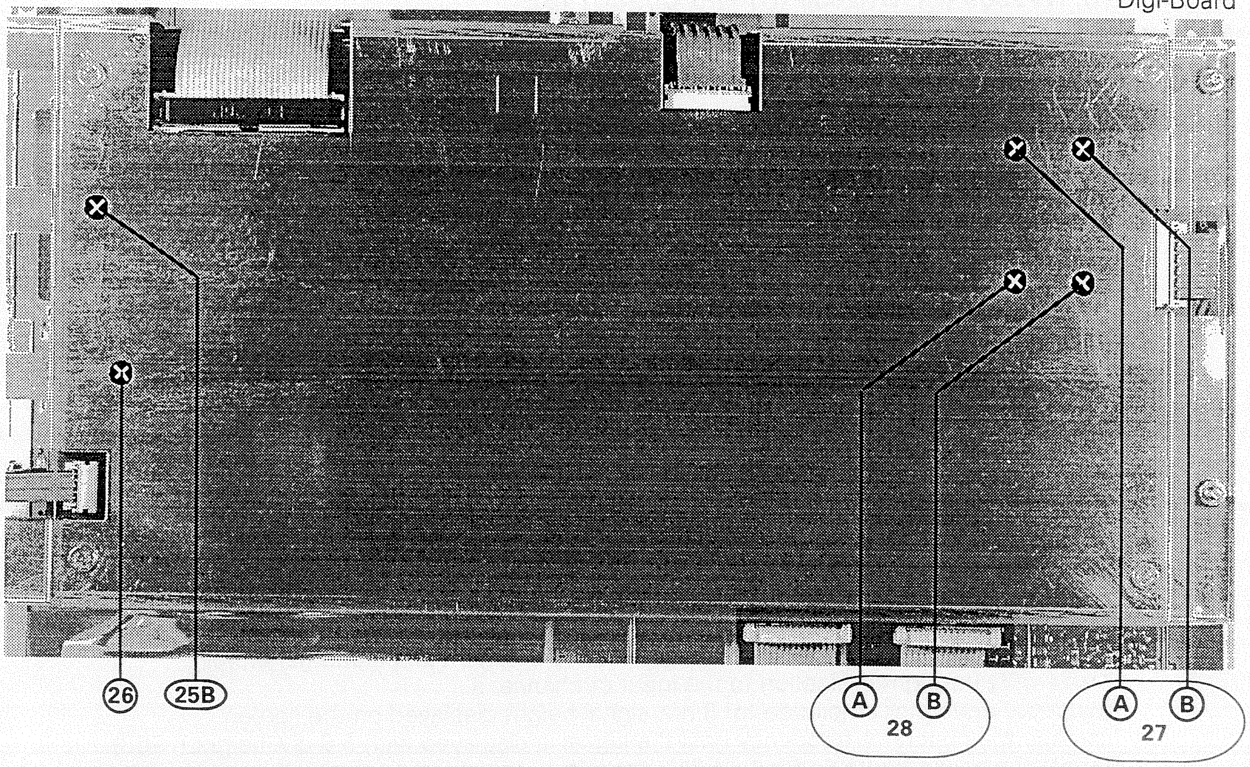
Oscilloscope Input	Input Atten.	Adjustment CH I
250mVpp	50mV/div	VC111 (A) flat top + VC113 (B) edge
2.5Vpp	0.5V/div	VC102 (C) flat top + VC105 (D) edge

24) C411 (A)/413 (B)/402 (C)/405 (D): Attenuator Compensation CH II.

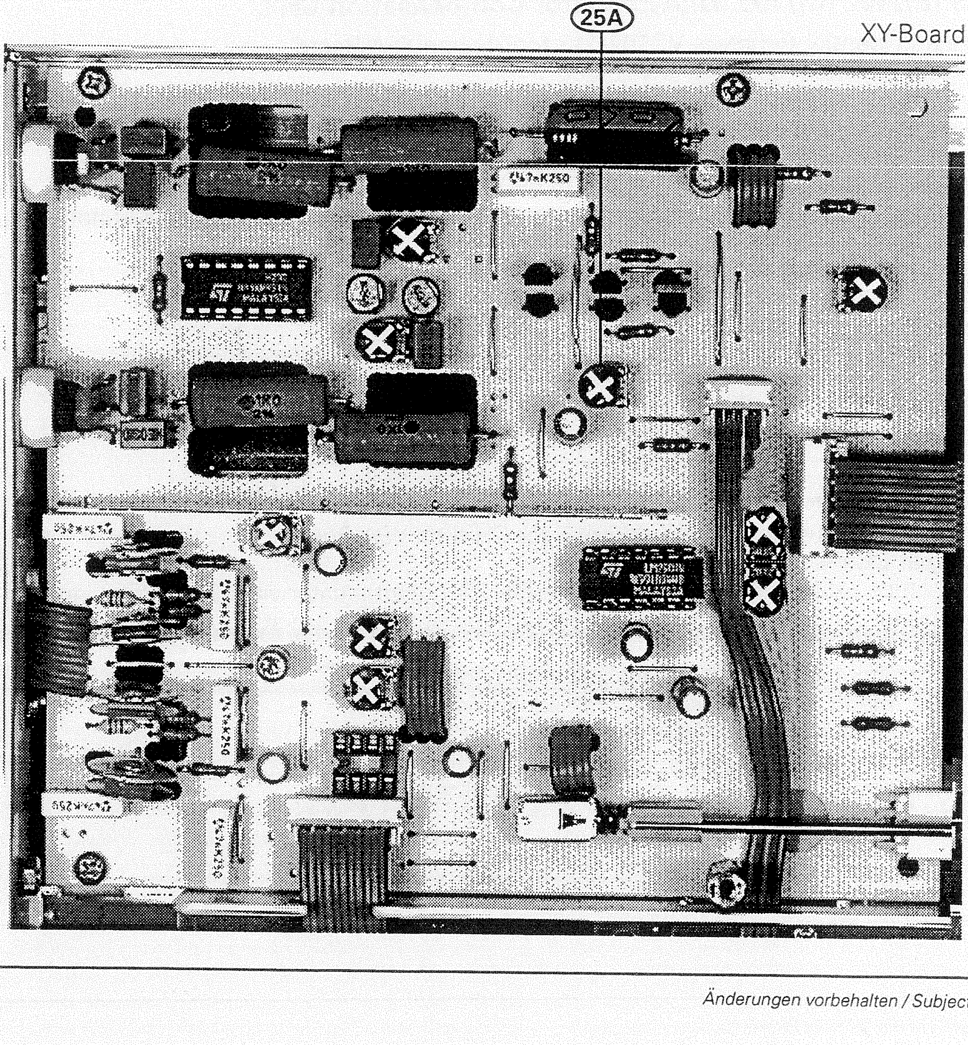
Locate and identify trimmers VC402-413 for CH II on YPA-Board.
Check that DC input coupling is selected.
Set amplitude calibrator to 1kHz and connect a 2:1 pre-attenuator via 50Ω cable to input of CH I.
Set calibrator output voltage to 80mVpp (40mVpp at the 2:1 pre-attenuator output, if terminated with 1MΩ).
Check that input attenuator CH II is set to 5mV/div.
Adjust trimmer in pre-attenuator for flat squarewave top.
Adjust compensation as listed in the table below:

Oscilloscope Input	Input Atten.	Adjustment CH I
250mVpp	50mV/div	VC411 (A) flat top + VC413 (B) edge
2.5Vpp	0.5V/div	VC402 (C) flat top + VC405 (D) edge

Digi-Board


26
25B
A
B
28
A
B
27

XY-Board



(25) RV2501 (A): Storage Mode Y-Gain
RV9100 (B): Storage Mode Y-Symmetry

Release POWER pushbutton (out!).
Locate and identify IC9204 (RAM) on DIGI-Board.
Remove IC9204 from the socket.
Insert Yt-EPROM HM1007 in the RAM socket.
Locate and identify RV2501 (25A) on XY-Board.
Locate and identify RV9100 (25B) on Digi-Board.
Press POWER pushbutton (on!).
Press STOR. pushbutton (in!).
Press DUAL pushbutton (in!).
Now two horizontal lines should be visible.
Adjust RV9100 (25B) to move the upper horizontal line to that graticule line which is 1 division under the horizontal center line of the graticule.
Adjust RV2501 (25A) to get a distance of exactly 2 divisions between both horizontal lines.
If necessary repeat both adjustments until optimum is obtained.
For the next adjustment the Yt-EPROM is again required.

⚠ ***Please note:*** *As a result of the crt deflection non-linearities and the influence of the earths' magnetic field, minor deviations from the optimum are unavoidable.*

(26) RV9101: Dot-Join Overshoot

Locate and identify RV9101 (26) on Digi-Board.
Press the X-MAG. x10 pushbutton (in!).
Turn the X-POS. control to make the signal start visible. The signal starts with the first dot underneath the following horizontal line.
Adjust RV9101 (26) to a sharp but overshoot free transition from the first dot to the horizontal line.

Release POWER pushbutton (out!).
Remove Yt-EPROM from the socket.
Insert IC9204 (RAM) in the RAM socket.
Press POWER pushbutton (in!).

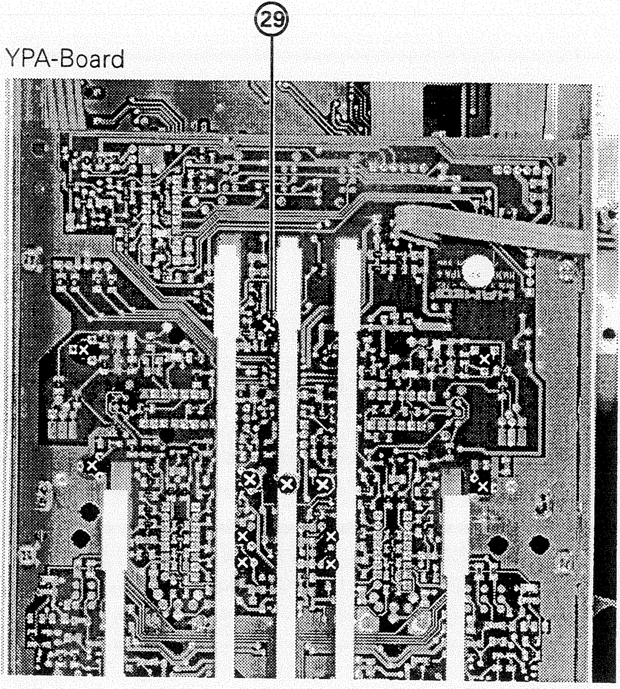
(27) RV9700 (A), RV9701 (B): Digital Y-Gain/Offset CH I.

Locate and identify RV9700 (27A) and RV9701 (27B) on Digi-Board.
Release CH I/II pushbutton (out!).
Connect a 25mV/1kHz squarewave signal via 50Ω cable and 50Ω through terminator to input channel I.
Set time base to 1ms/div.
Check that the STOR. pushbutton is released (out!).
Move signal with Y-POS I control to the 0% and 100% marker lines and remember signal height and position.
Press STOR. pushbutton (in!) for digital mode.
Adjust RV9700 (27A) for the same signal height and RV9701 (27B) for the same Y-position of the signal as before in analogue mode.
Release and press STOR. and watch the display.
There should be no difference between analogue and digital mode.

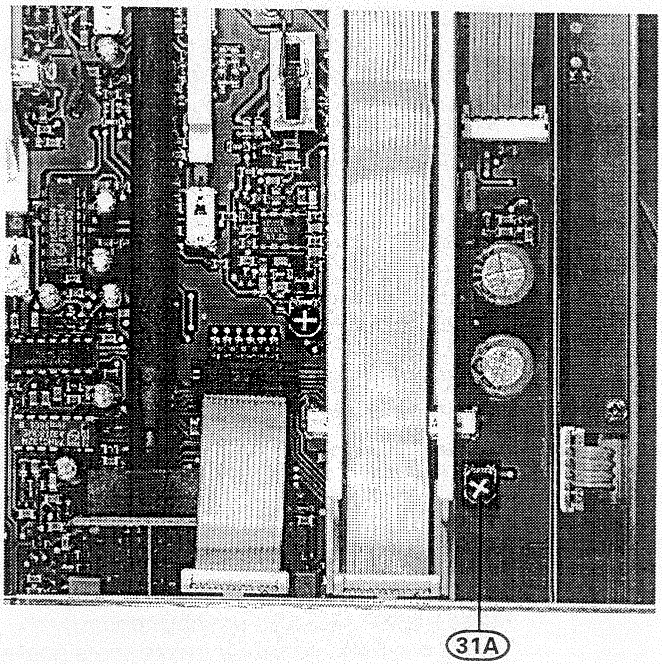
(28) RV9800 (A), RV9801 (B): Digital Y-Gain/Offset CH II.

Locate and identify RV9800 (28A)and RV9801 (28B) on Digi-Board.
Press CH I/II pushbutton (in!).
Connect a 25mV/1kHz squarewave signal via 50Ω cable and 50Ω through terminator to input channel II.
Set time base to 1ms/div.
Move signal with Y-POS II control to the 0% and 100% marker lines and remember signal height and position.
Press STOR. pushbutton (in!) for digital mode.
Adjust RV9800 (28A) for the same signal height and RV9801 (28B) for the same Y-position of the signal as before in analogue mode.
Release and press STOR. and watch the display.
There should be no difference between analogue and digital mode.

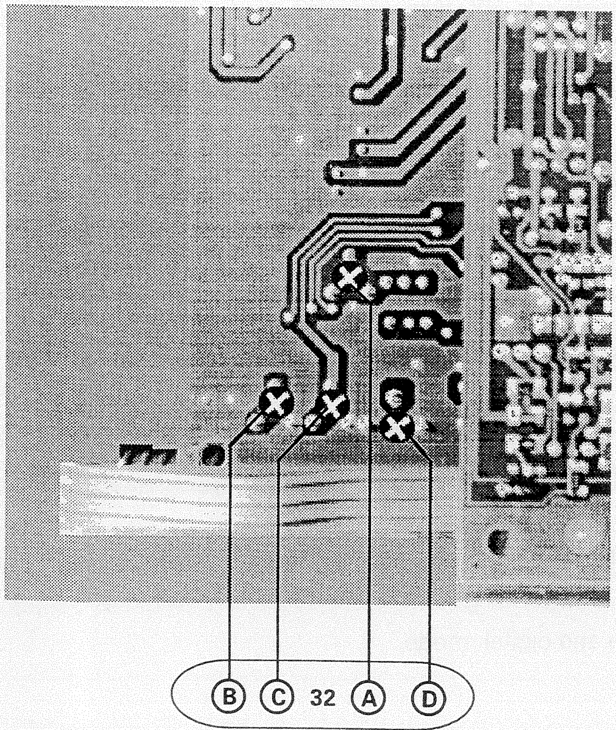
YPA-Board



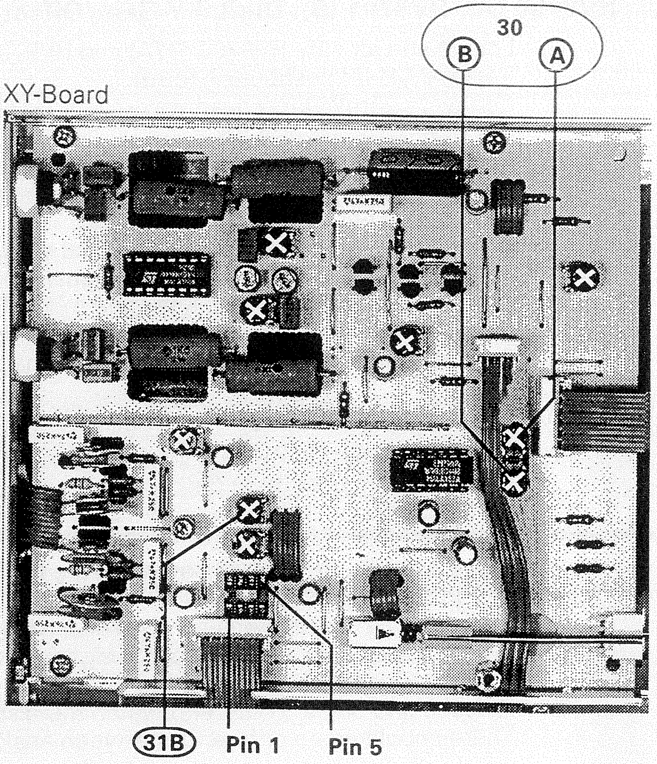
TB-Board



TB-Board



XY-Board


30
B
A
31B
Pin 1
Pin 5

(29) R663: Digital ADDition/Offset.

Press DUAL pushbutton (in!).
Locate and identify R663 (29) on YPA-Board.
Set input coupling CH I and II to GD.
Press STOR. pushbutton (in) for digital mode.
Move both baselines with Y-POS. I and II controls to the horizontal center line of the graticule.
Release DUAL pushbutton (out!).
Press ADD pushbutton (in!).
Adjust R663 (29) for the same signal position as before in DUAL storage mode.

(30) RV2417 (A), RV2418 (B): Overscan.

Locate and identify RV2417 (30A) and RV2418 (30B) on XY-Board.
Press channel I and channel II GD pushbuttons (in!).
Press DUAL pushbutton (in!).
Set baseline with Y-POS.I control to the top line of the graticule.
Set baseline with Y-POS.II control to the bottom line of the graticule.
Adjust RV2417 (30A) for just lighting up of the upper LED.
Adjust RV2418 (30B) for just lighting up of the lower LED.
Repeat both procedures until both adjustments are correct.

(31) RV3421 (A), RV2225 (B): Digital Time Base Adjustment.

Locate and identify RV3421 (A) on TB-Board.
Locate and identify pin 7 of test socket on XY-Board.
Press STOR. button (in !).
Measure sawtooth with an oscilloscope and a 10:1 probe at pin 7 of test socket and adjust RV3421 (31A) for 4.8Vpp signal height.
Locate and identify RV2225 (31B) on XY-Board.
Set time base to 20µs/div.
Set Time Mark generator to f= 50kHz and connect signal to CH I input.
Set input attenuator channel I for approx. 4 divisions signal amplitude on the CRT.
Move trace with X-POS. control so that the first time mark coincides with the first left graticule line of the screen.
Adjust RV2225 (31B) so that the 11th time mark coincides with the last right graticule line.

(32) RV3519 (A)/3589 (B)/3591 (C), CV3511 (D): Analogue Time Base.

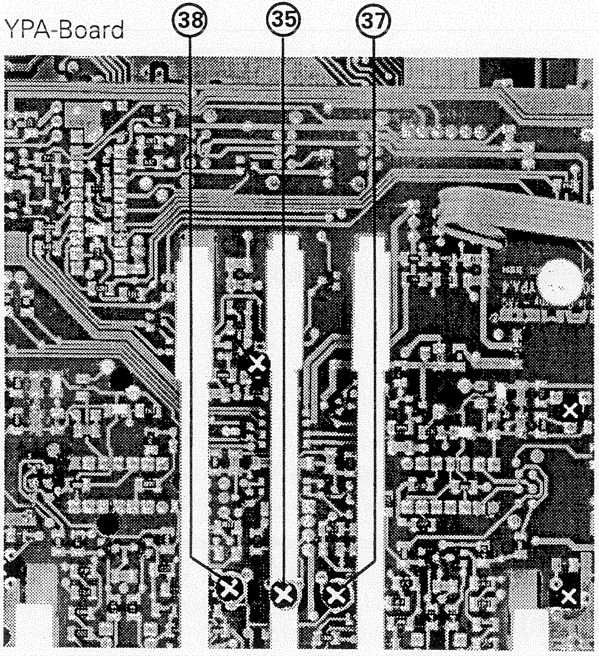
a) As the Digi-Board is located above the adjustment points of the TB-board, the adjustment points are not accessible from the top side, but from the bottom side of the PCB.
Locate and identify RV3519 (32A) on TB-Board.
Check that the time base setting is 20µs/div. and time base variable control is in CAL position.
Press and release STOR. pushbutton and adjust RV3519 (32A) for the same analog trace start position as in digital mode.
Release STOR. pushbutton (out!).

b) Locate and identify RV3591 (32C) on TB-Board.
Set Time Mark generator to f= 20kHz and connect signal to CH I input.
Set time base to 50µs/div.
Move trace with X-Pos. control so that the first time mark coincides with the first left graticule line of the screen.
Adjust RV3591 (32C) so that the 11th time mark coincides with the last right graticule line.
Rotate time base variable control to fully left position.
Now more than 2.5 time marks per division should be displayed.

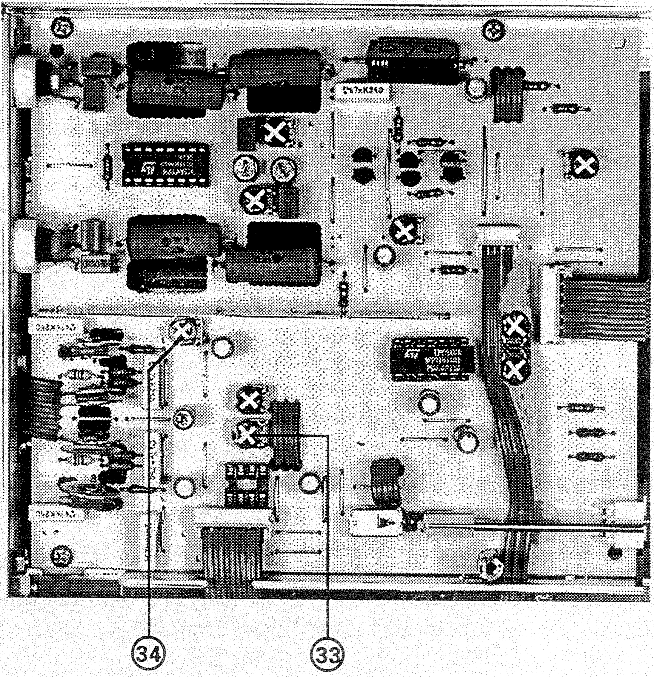
c) Locate and identify CV3511 (32D) on TB-Board.
Set Time base to 0.5µs/div. and time base variable control to CAL position.
Set Time Mark generator to f= 2MHz.
Move trace with X-POS. control so that the first time mark coincides with the first left graticule line of the screen.
Adjust CV3511 (32D) so that the 11th time mark coincides with the last right graticule line.

d) Locate and identify RV3589 (32B) on TB-Board.
Set Time base to 5ms/div. and time base variable control to CAL position.
Set Time Mark generator to f= 200Hz.
Move trace with X-POS. control so that the first time mark coincides with the first left graticule line of the screen.
Adjust RV3589 (32B) so that the 11th time mark coincides with the last right graticule line.
Check all time base settings with suitable time mark signals.

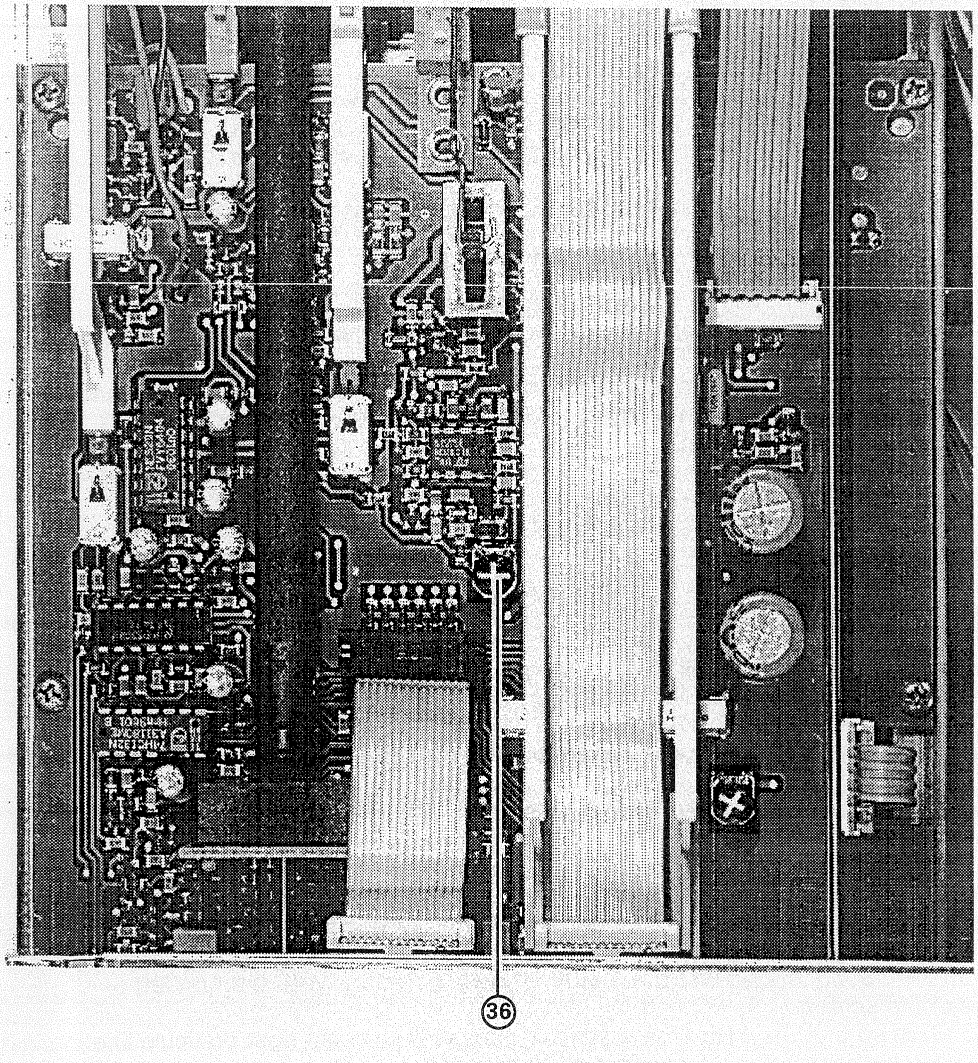
YPA-Board



XY-Board



TB-Board



(33) RV2234: X-Magnification x10.

Locate and identify RV2234 (33) on XY-Board.
Check that STOR. pushbutton is released (out!).
Press pushbutton X-Mag. x10.
Set time base to 50µs/div.
Set Time Mark generator to f= 20kHz and connect signal to CH I input.
Set X-POS control to mechanical center.
Using X-POS control, move the visible time mark to the first left graticule line.
Adjust RV2234 (33) so that the next time mark coincides with the last (right) graticule line.
Release X-MAG. x10 pushbutton (out!).

(34) RV2260: X-Amplifier Symmetry

Set time base to 20µs/div.
Release STOR. pushbutton (out!).
Locate and identify RV2260 (34) on XY-Board.
Set X-POS control to mechanical center.
Adjust RV2260 (34) for a symmetrical trace start and trace end position in respect to the graticule.

(35) R624: XY-Gain

Connect a 1kHz squarewave signal of 25mVpp amplitude (HZ60-2) to input CH II.
Check that the CH II input sensitivity is 5mV/div.
Check that input coupling CH II is set to DC.
Locate and identify R624 (35) on YPA-Board.
Press XY pushbutton.
Set X-POS control that the left dot coincides with the graticule center.
Adjust R624 (35) for a distance of 5 division between left and right dot.

(36) RV3293: Trigger-Symmetry

Locate and identify RV3293 (36) on TB-Board.
Connect a 50kHz sinewave signal of 40mVpp amplitude to input CH I.
Set input coupling CH I to AC.
Check that trigger coupling is in AC position.
Set attenuator switch CH I to 0.1V/div (calibrated position).
Press AT/NORM. pushbutton (in!).
Turn LEVEL control for triggering (center position).
Reduce signal height and correct LEVEL setting for just triggering with a minimum signal height.
Press and release the trigger SLOPE ± pushbutton and adjust RV3293 (36) for stable triggering in both SLOPE conditions.

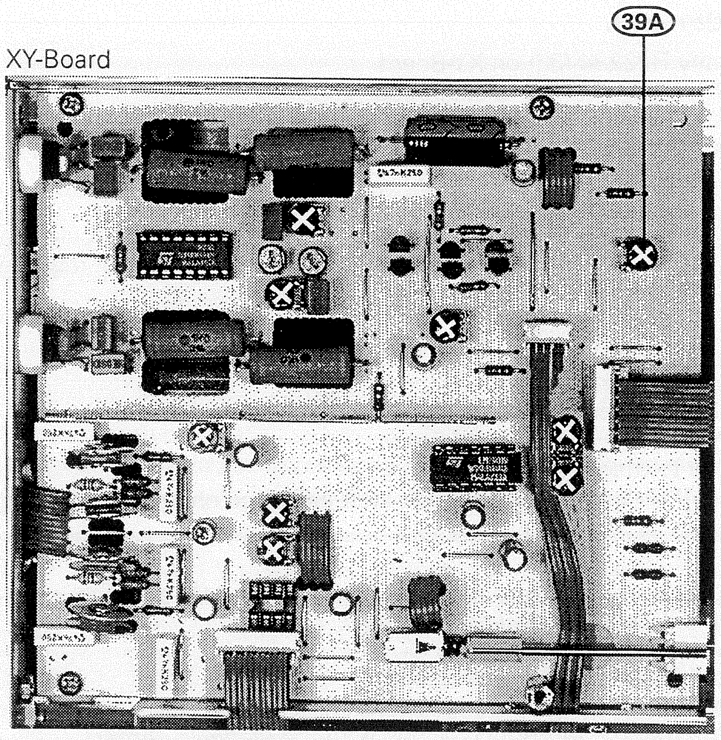
(37) R612: DC-Triggering CH I.

Locate and identify R612 (37) on YPA-Board.
Connect a 50kHz sinwave signal to input CH I.
Set generator amplitude to 8cm.
Set time base to 10µs/div.
Press AT/NORM. pushbutton (in!).
Turn LEVEL control to the center position.
Release AC/DC input coupling pushbutton channel I (out!).
Constantly switch between AC and DC trigger coupling and watch the trace start position.
Adjust R612 (37) so that there is no difference regarding the signal start position on the signal slope between DC and AC trigger coupling.

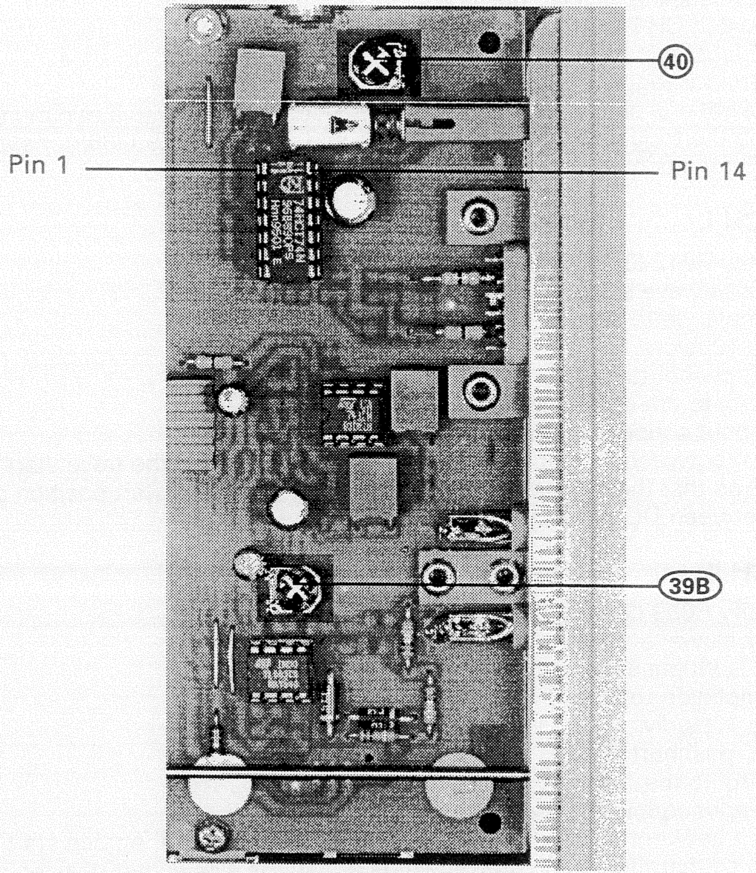
(38) R603: DC-Triggering CH II.

Locate and identify R603 (38) on YPA-Board.
Connect a 50kHz sinwave signal to input CH II.
Press CH I/II-TRIG I/II pushbutton (in!).
Set generator amplitude to 8cm.
Set time base to 10µs/div.
Press AT/NORM. pushbutton (in!).
Turn LEVEL control to the center position.
Release AC/DC input coupling pushbutton channel II (out!).
Constantly switch between AC and DC trigger coupling and watch the trace start position.
Adjust R603 (38) so that there is no difference regarding the signal start position on the signal slope between DC and AC trigger coupling.

XY-Board



CT-Board


40
Pin 1
Pin 14
39B

(39) RV2301 (A), RV4322 (B): Component Tester Y-Position and Tilt.

Release all pushbuttons (out!).
Press COMPONENT TESTER pushbutton (in!).
Locate and identify RV2301 (39A) on XY-Board.
Adjust RV2301 (39A) to shift the approx. 8 div. horizontal component tester trace to the horizontal center of the CRT graticule.
Locate and identify RV4322 (39B) on CC-Board.
Set up the instrument on a table in normal operating conditions to avoid misadjustment due to the influence of the earth magnetic field.
Adjust RV4322 (39B) in such a way that the trace is parallel to the horizontal graticule center line and not tilt.

(40) RV8940: Calibrator Output.

Locate and identify VR8940 (40) on CC-Board.
Connect a digital multimeter to the 0.2Vpp calibrator output.
Set up the digital multimeter for DC measurement in a suited sensitivity setting.
Locate and identify IC8903 on CC-Board.
Connect pin 1 and pin 14 of IC8903 galvanically together.
Adjust VR8940 (40) for exactly 0.2V DC.
Check 2V calibrator output.
Remove the connection between pin 1 and pin 14 of IC8903.

Connect a 10:1 probe to the 0.2Vpp calibrator output and connect it to the CH I input of the scope.
Release all pushbuttons (out!).
Select CH I DC input coupling.
Set attenuator CH I to 5mV/div (calibrated detent).
Set time base to 0.2ms/div.
Now approximately 2 signal periods should be visible on the screen.
Press 1kHz/1MHz pushbutton (in!).
Set time base to 0.5µs position.
Check 1MHz calbrator signal.

⚠ ***Please note:*** *Neither the calibrator frequency nor the pulse duty factor are specified.*

(41) Trigger Filter Check.

Set time base to 1ms/div.
Connect a 1kHz sinewave signal of 40mVpp amplitude to input CH I and check for full screen deflection.
Set input attenuator CH I to 50mV/div and check for 8mm display height.
Select trigger coupling from AC to DC and LF. The signal must always trigger .
Set sinewave generator to 50kHz and 40mV output amplitude and check for 8mm display height.
Select trigger coupling from AC to DC. The signal must always trigger.
Select LF trigger coupling. Now the signal should not trigger.

(42) Triggerbandwidth Check.

Set time base to 0.05µs/div, time base variable to CAL position.
Set input coupling switch CH I to DC.
Set trigger coupling to AC.
Release AUTO/NORM pushbutton (out!).
Set input attenuator CH I to 5mV/div.
Connect a 100MHz sinewave signal to input CH I.
Adjust generator output for 5mm display height.
The signal must be triggered.

(43) External Trigger Check.

Set time base to 20µs/div.
Set input attenuator CH I to 0.1V/div.
Connect a 50kHz sinewave signal via a 50Ω through terminator with an amplitude of 280mVpp (100mVrms) to input CH I and check for 2.8div display height.
Set LEVEL to midrange position.
Check that the Trigger-LED is ON.
Press EXT. pushbutton. The Trigger-LED (TR) should now be OFF.

Set input coupling CH I to GD.
Remove signal cable from input CH I and connect it to TRIG.INP. socket. Do not change generator settings.
Now the Trigger-LED should be ON again.

(44) Video Trigger Check.

Set CH I input coupling switch to DC.
Connect video signal with positiv sync. pulses to input CH I.
Adjust input attenuator switch CH I for 1 div display amplitude of video signal.
Set time base to 5ms/div (time base ≥ 1ms/div = frame triggering).
Set trigger coupling switch to TV.
Check that trigger starts with vertical sync. pulses.
Now approx. 2.5 frames should be visible.
Change polarity of video signal.
Press SLOPE pushbutton (in!).
Again approx. 2.5 frames should be displayed triggered.
Set time base to 20µs/div (time base range 0.5ms/div - 0.1µs/div = line triggering).
Recheck trigger SLOPE pushbutton procedure, using video signal with polarity change.

⚠ ***Note:*** *Invert pushbutton does not affect trigger polarity.*

(45) Pretrigger Check.

Release all pushbuttons (out!).
Press STOR. pushbutton (in!).
Connect a 1kHz squarewave signal with 25mVpp amplitude at 50Ω to CH I input.
The signal display should start (left) with a rising edge which should be set on the upmost left graticule line by turning the X-POS. knob.
Press PRE-TRIG. pushbutton (in!).
The rising edge should now be visible in the center range of the screen.

(46) Interface Connector Check.

Readout of data memory:

Switch the oscilloscope OFF (POWER pushbutton out!).
Connect the HAMEG Graphic Printer HD148 (Software ≥ V1.3) with the HM305.
Press HM305 POWER pushbutton (in!).
Press HD148 POWER pushbutton (in!).
Press HM305 STOR. pushbutton (in!).
Insert suited signals to the channel I and II inputs.
Press DUAL pushbutton (in!).
Press HOLD pushbutton (in!).
Set HD148 to ONLINE MANUAL without ZOOM function.
Press PRINT pushbutton.
Check the hardcopy for deviations in respect to the oscilloscope display.
Release HOLD pushbutton (out!).
Press AUTO/NORM pushbutton (in!) for normal trigger mode.
Turn LEVEL knob for triggering.
Press TRIG EXT. pushbutton so that no further triggering occurs.
Select SINGLE-mode (SGL) and check that the RESET LED is ON.
SET HD148 to ONLINE AUTOMATIC mode.
Release and press the TRIG EXT pushbutton to generate a trigger event.
Check that after the data aquisition the RESET LED is OFF and the HD148 starts printing.
Check that after the print procedure is finished, the printer switches the RESET light-emitting diode ON.

Deviations of more than 2mm in amplitude and/or position are unacceptable.

Switch off the graphic printer and the oscilloscope and disconnect the Printer-cable from the scope.

Writing data into memory

Check that the oscilloscope is switched OFF.
Connect HO79-5 with HM305.
Set HO79-5 to RS232 or IEEE-488 device mode.
In IEEE mode, connect HO79-5 via HZ72 to a suited IEEE-488-bus controller (PC).
Press the HM305 HOLD pushbutton (in!).
Press the HM305 POWER pushbutton (in!).
Check that random dots are visible on the screen.
Start the software SP91 version ≥ 3.6 to write data from the PC into the oscilloscopes memory.
Transmit signal data stored in the PC's memory to HO79-5 and HM305.
Check that the transmitted signals are visible on the screen.